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# A CASE OF HIGHLY ABNORMAL BLOOD GROUP ASSOCIATED WITH AUTO-AGGLUTINATION IN THE COLD.

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(Results expressed in the international nomenclature.)

S. B., a Muhammadan female aged 26, was admitted to the Eye Infirmary of the Medical College Hospital, Calcutta, under the care of Mr. Ahmed, with the diagnosis of anæmia with cataract. The spleen was enlarged, the Wassermann reaction was negative, and there had been no previous blood transfusion. As it was desired to perform a blood transfusion, specimens of citrated cells and of whole blood were sent to us as usual for blood grouping tests and selection of a suitable blood donor.

Her washed cells tested for iso-agglutination against sera of known groups yielded the following reactions:—

With group O serum +.

With group A serum +.

With group B serum +.

Therefore as judged from her cells her blood group is AB. Her serum tested for iso-agglutination against cells of known groups yielded the following reactions:—

With group A cells +.

With group B cells +.

These serum reactions are highly abnormal in a blood whose cells are of group AB.

We accordingly drew a fresh blood sample from the patient and retested her washed cells and serum, respectively, with several different sets of grouping sera and cells of known group. The results were identical with those shown above. As it was evident we had to deal with a very extraordinary case, full investigation was carried out.

Routine blood examination showed the following:—

Hæmoglobin	..	40 per cent.
Red cell count	..	3,250,000* per c. mm.
White cell count	..	3,700 per c.mm.
Differential white cell count:—		
Polymorphonuclears	..	55 per cent.
Small mononuclears	..	34 "
Large mononuclears	..	6 "
Large hyalines	..	2 "
Eosinophiles	..	3 "

\* This later fell to 2,000,000 per c.mm.

abnormal iso-agglutination reactions being discovered, the blood should be classified as to group according to the reactions of the cells (agglutinogens) and not according to the serum reactions (agglutinins). On this basis the group of the patient is AB (Moss group I). It follows that this blood does not fall into the category of the so-called "defect types." On the contrary, additional factors are present, as the serum agglutinated both group A cells and group B cells, which should not be the case.

We may now record and analyse the numerous experiments performed to elucidate the nature of the abnormality.

1. The cells of the patient were again tested against a known group O serum. The reactions of this particular group O serum were fully controlled against known cells of groups A and B and were completely normal. The agglutination was positive. The group of the patient being assumed to be AB, this experiment with group O serum must yield a positive agglutination.

2. The cells of the patient were also tested against four different fully controlled sera of group A, with positive agglutination in each case. With cells assumed to be of group AB, these reactions must necessarily be positive.

3. Similarly, the cells of the patient were tested against four different fully controlled sera of group B, again with positive agglutination in each instance. With cells believed to be of group AB, all these reactions must necessarily be positive.

4. The patient's serum was now tested against the cells of a normal case of group AB. The agglutination was positive. Herein lies the abnormality. A serum from a blood containing cells provisionally grouped AB here agglutinates the cells of a blood definitely known to be of group AB. We may now provisionally conclude that agglutinins are present in the patient's serum which are not in accordance with Landsteiner's rule.

5. The patient's serum was also tested against the cells of four persons of group A. The agglutination was positive in each case. With a normal serum of group AB these reactions should, of course, be negative; but this abnormal case of assumed group AB is here seen to contain an agglutinin for group A cells.

6. The patient's serum was similarly tested against the cells of five persons of group B. The agglutination was positive in each case, showing the presence also of an agglutinin for group B cells.

As agglutinins effective against both group A cells and group B cells are present, the reason for the positive agglutination of the normal group AB cells in experiment 4 will be evident.

7. The patient's serum was tested for agglutination against her own washed cells. The

... was negative. There is thus at laboratory temperature no evidence of auto-agglutination.

8. The patient's serum was tested for agglutination against her own washed cells in the refrigerator. The result was positive. There is thus definite evidence of auto-agglutination in the cold. This will be referred to in greater detail below.

9. The patient's cells were incubated for two hours at 37°C. with a normal group O serum. After the incubation, the serum was separated and tested for agglutination against cells of group A and group B, yielding a completely negative reaction in each case. The patient's cells can thus absorb from group O serum both the anti-A and anti-B agglutinins, thereby showing the presence in the patient's cells of both A and B agglutinogens. This confirms the correctness of the assumption that the true group of the patient is AB.

10. The serum of the patient was now absorbed with cells of group A for two hours in the incubator at 37°C. After removal of the cells the serum was tested for agglutination against cells of groups AB, A and B with results as under:—

With cells AB +.  
With cells A —.  
With cells B +.

This experiment has removed the anti-A agglutinin from the patient's serum.

11. Similarly, the serum of the patient was absorbed with cells of group B under the same conditions. After removal of the cells the serum was tested against cells of groups AB, A and B with results as under:—

With cells AB +.  
With cells A +.  
With cells B —.

This experiment has removed the anti-B agglutinin.

12. Similarly, the patient's serum was absorbed with group AB cells under the same conditions, and after separation of the cells the absorbed serum was tested against cells AB, A and B with results as under:—

With cells AB —.  
With cells A —.  
With cells B —.

Clearly, both the agglutinins have now been removed.

The last three experiments show that the patient's serum contains both the anti-A and the anti-B agglutinins, and that they may be removed by absorption either separately or together. We therefore reach the extraordinary conclusion that both anti-A and anti-B agglutinins are present in this patient's blood along with the A and B agglutinogens, a condition which involves an infringement of Landsteiner's rule, and which one would suppose to be incompatible with life. Yet, as we have seen, the patient's serum does not agglutinate her own

cells at laboratory temperature (25°C.). The patient's serum agglutinates her own cells sharply at refrigerator temperature (approximately 8°C.).

We may now consider experiments which were carried out to ascertain if this auto-agglutination in the cold had any bearing on the anomalous grouping reactions described above.

13. The patient's serum was again tested for agglutination in the refrigerator against her own washed cells. The result was, as above noted, positive. The preparation was left in the refrigerator for two hours. It was then removed and divided into two parts:—

(i) *The smaller portion.*—This was placed in the incubator at 37°C. to see if the agglutination disappeared. The positive reaction completely disappeared, i.e., the reaction is reversible.

(ii) *The larger portion.*—This was centrifuged as rapidly as possible and after centrifugation the separated serum was tested for agglutination against cells of group A and group B. The results were positive in both cases.

It was naturally not possible to carry out centrifugation at refrigerator temperatures, but we think it probable that in this last experiment we have removed the auto-agglutinin from the patient's serum. After the absorption the abnormal agglutination of both group A cells and group B cells still persists.

We conclude accordingly that although this patient's serum exhibited a high degree of auto-agglutination in the cold, yet this is not the cause of the highly abnormal blood group. It would thus seem that in exceptional circumstances it is possible for a blood to contain both the A and B agglutinogens and both the anti-A and anti-B agglutinins, and yet in some unexplained way not to show auto-agglutination either *in vivo*—this presumably never occurs—or *in vitro* at laboratory temperatures (25°C.).

The surgeon in charge of this case was advised that blood transfusion might be followed by a grave accident, and that we were not prepared to pass any blood donor as safe for the purpose.

In view of the possibility that this abnormality might be familial, we attempted to obtain blood samples from the patient's near relations. Of these we were only able to examine one, a brother aged 45. On grouping he was found to be an entirely normal instance of group AB, i.e., the same group as the "fundamental" group of the patient. His serum also sharply agglutinated his own washed cells in the refrigerator. The test for reversibility was inconclusive.

The technical methods used by us for some years now for the determination of blood groups have been closely considered in their theoretical aspects and extensively tested in practice, and they have invariably yielded extremely satisfactory results.

We may conclude this article by a reference to certain forms of hæmaglobin.

which, though non-specific and independent of the four group scheme, may yet produce a result somewhat similar to that produced by the genuine iso-agglutination. These allied reactions have consequently an important bearing on the controls required in a technically correct blood grouping procedure.

This subject is a somewhat complicated one, and a brief precise statement which would cover all the recorded observations is not possible, the more so as the explanations offered by different workers are not in all cases in complete accord. It may be said, however, that there are two main types of "false reactions" which may be sharply distinguished both from genuine iso-agglutination and from one another. These two types are now termed "pseudo-agglutination" and "auto-agglutination."

*Pseudo-agglutination.*—It is well known that under certain conditions, especially in inflammatory diseases, the blood cells tend to settle unusually rapidly, leading to the formation of a buffy coat. This is a normal phenomenon in horse blood. The work of Shattock and of Lattes has shown that this phenomenon, termed pseudo-agglutination, is due to exaggeration of the normal power of the serum to aggregate the erythrocytes in the form of rouleaux. Shattock showed that this form of clumping disappears on slight dilution, 1:2, 1:3. The active principle by which this form of clumping is brought about is non-specific and non-absorbable by red cells. These two characteristics and the disappearance of the positive reaction on slight dilution serve to distinguish this phenomenon from the genuine iso-agglutination occurring in accordance with the four group scheme. As in iso-agglutination, temperature changes have little influence on pseudo-agglutination. The practical deduction in the development of an accurate blood grouping technique is that sufficient dilution of the reagents must be ensured.

The possibility of pseudo-agglutination must be borne in mind when applying blood grouping tests in the forensic examination of bloodstains, as under these conditions there is a tendency to employ the reagents in too great concentration.

Pseudo-agglutination may, according to Lattes, be avoided by receiving the erythrocytes into a specially prepared solution of lecithin.

*Auto-agglutination.*—Cells may be agglutinated by their own serum at refrigerator temperatures (5 to 10°C.). This phenomenon is apt to undergo considerable intensification in certain pathological conditions, of which anæmia and trypanosomiasis are prominent examples. The reaction occurs only in the cold, and is reversible. This is the "cold agglutination" of Amzel and Hirsfeld, or the "panagglutination" of Mino. If cells thus agglutinated in the refrigerator by their own serum are washed with ice cold saline, and the preparation warmed to room temperature, the cell clumps break up, and the previously absorbed auto-agglutinin is set free. If the preparation be now centrifuged, the supernatant saline, which

now contains the auto-agglutinin, will again agglutinate red cells at refrigerator temperatures. The auto-agglutinin, though non-specific, is thus absorbable, differing in the former respect, though similar in the latter, to the genuine iso-agglutinin. The outstanding distinction is of course the fact that auto-agglutination vanishes at 37°C., and is hardly at all in evidence at room temperatures, and certainly cannot in India be confused with iso-agglutination.

If tests for iso-agglutination are carried out at 37°C., it is necessary first to inactivate the grouping sera by heating to 55°C. for half an hour, otherwise the occurrence of hæmolysis may obscure a positive iso-agglutination (Schiff).

A special form of non-specific agglutination is sometimes observed with blood cells which have been preserved too long. These positive reactions, termed the Hübener-Thomsen phenomenon, are due in many cases to bacterial contamination, and this peculiarity may be conveyed by inoculation to a blood previously reacting normally. In working with old specimens, it is therefore necessary to guard against the Hübener-Thomsen phenomenon. This is particularly important in the application of grouping tests to the forensic examination of bloodstains. This form of auto-agglutination also occurs only at refrigerator temperatures, and if there is any reason to suspect bacterial contamination, the blood grouping tests should be carried out at 37°C.

To exclude this phenomenon, a control of the cells under examination may be set up with serum of group AB, best with several such sera. These sera, being those of universal recipients, will, as regards true iso-agglutination, react negatively with the cells of all four groups. Consequently, if a positive agglutination reaction is obtained in this control, the presence of the Hübener-Thomsen phenomenon may be inferred.

As regards the case reported above, there was no possibility of the occurrence of the Hübener-Thomsen reaction as we were working with fresh material. This and other types of auto-agglutination could also be excluded as we were working in Calcutta in the hot month of September. There remains the possibility of pseudo-agglutination.

Although certain workers use test tube methods in preference to slide techniques on account of the somewhat greater tendency to non-specific results with the latter, it appears to us most improbable that the anomalous results described above were errors dependent on technique. The blood grouping method employed by us is a thoroughly tested slide technique, the grouping sera used were fully controlled, yielding negative reactions where they should, as well as positive reactions where they should. Moreover at room temperature the serum of the patient produced with her own cells—as would of course be expected—no agglutination whatever. Lastly, the results of the various absorption experiments described above appear very strongly to suggest

that the unusual reactions of this patient's serum were not non-specific in origin.

We desire to thank Mr. Ahmed, Honorary Surgeon, Eye Infirmary, Medical College Hospital, Calcutta, for the opportunity of examining this blood. In the preparation of the latter part of this paper we also desire to express our indebtedness to the monographs of Landsteiner, Lattes and Schiff quoted below.

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## THE SURGERY OF TUBERCULOSIS OF THE ILEO-CÆCAL REGION.

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It is an undeniable fact that the abdominal diseases of the ileo-cæcal region repeatedly claim the attention of the surgeon. The excuse for a short note on this subject is the great and possibly growing frequency of such diseases in the population around us at the present time.

The following figures show the incidence of tuberculosis in the United Provinces, taken from the annual reports of the Inspector-General of Civil Hospitals, United Provinces, and based on the statistics obtained from the Government hospitals and state aided dispensaries, etc.

Year.	T. B. Lungs.	Deaths.	Other tuberculous diseases.	Deaths.
1923	10,329	232	7,058	93
1924	11,864	307	8,739	110
1925	11,478	266	10,012	107
1926	12,912	272	10,860	97
1927	14,994	271	12,112	120

These figures may at best be taken as roughly proportional to the growing incidence of such diseases. They deal with but a fraction of the total number of such patients, and only with those who apply for relief at such hospitals and are diagnosed to be suffering from tuberculosis.

During this quinquennium it will be noticed that the rise in "other tuberculous diseases" has been one and a half times more than that of the pulmonary type. While some of the increased

incidence is attributable to more accurate diagnosis by greater laboratory and X-ray facilities than were available formerly, yet there is unquestionably a rise in the absolute and total incidence of the disease. No separate statistics for abdominal tuberculosis are available, and any such worked out from individual hospital records would not be helpful owing to multifarious statistical fallacies creeping in. The current surgical literature does not give an active interchange of views on this subject among the numerous workers in the field of abdominal surgery.

The following are brief clinical notes on a few of the cases referred for surgical treatment during the last few months:—

*Case 1.*—K. B., 35 years old, male. Complained of pain in the abdomen, called by patient gas pains for five years at weekly intervals, lasting a maximum period of 10 hours; gurgling in the lower abdomen. No abnormal temperature; pulse 72 to 80 p. m. No definite lump or swelling palpable; discomfort on deep pressure in the right iliac fossa. Rectal examination, no abnormality detected.

Laparotomy:—Cæcum and appendix normal. Terminal portion of the ileum for a distance of about 9 inches thickened, congested and leathery; distinctly enlarged glands in the root of the mesentery; one excised and sectioned, found typically tuberculous. Ileo-colostomy performed. After a week complete relief from pain and could take ordinary food which had been denied to him for years. Left hospital after five weeks later, having no complaint.

*Case 2.*—K. S., 35 years, male. Colicky pains for 2 years on and off after meals or in his own expression at "digestion time" (stated by patient to be 5 or 6 hours after meals). Lump felt in the right iliac fossa for the last six months. Pain persistent. No abnormal temperature; pulse between 76 and 90 p. m.

Physical examination showed a diffuse resistance in the right iliac region; a deep and ill defined round lump on palpation; size 3½ inches in diameter; slightly movable from side to side; tympanitic on percussion; rectal examination nothing abnormal. Total leucocyte count 9,600 per c.mm.

Abdominal section revealed a thickened and fibrotic cæcum, the thickening and congestion continued along the ascending colon for about 2½ inches, a few small lymphatic glands along its antero-medial surface. The terminal ileum had two transversely situated patches of tuberculous peritonitis, about 6 and 9 inches from the ileo-cæcal junction, indicating tuberculous ulcers in the gut underneath. Lateral anastomosis between ileum and proximal part of the transverse colon was performed with relief of local symptoms immediately after the operation. Patient left hospital in three weeks, stating that he had no trouble.

*Case 3.*—R., female, 25 years. Pain in the right side of the abdomen for one year. Fever, marked in the evenings, for three months. Patients suffered from fever lasting for five months after the birth of a child two years previously. Four months previously a lump developed in the right iliac fossa. Bowels acting irregularly; no diarrhoea, no vomiting, or nausea. Blood examination—no leucocytosis, no abnormality in the differential white count.

Local examination—a nodulated round lump in size about 4 inches in diameter was felt in the right iliac and lower right lumbar region. Not movable; percussion note tympanitic. No note available of the result of rectal or vaginal examination, but as far as remembered no lump or tenderness was felt.

Laparotomy revealed a thickened and adherent cæcum with diffuse scattering of small tuberculous lymphatic glands in the mesentery. Ileo-colostomy done, followed by immediate relief, a small lump could only be slightly

felt in the right iliac fossa four weeks later when the patient left hospital, expressing herself free from any complaint.

*Case 4.*—R. D., female, aged 20 years. Childbirth 5 months previously followed by fever daily for 4 to 5 weeks, aggravated during attacks of pain in the abdomen; subsequently she used to get attacks of pain in the abdomen with vomiting (once or twice) and fever lasting not more than 24 hours simulating in history recurrent appendicitis.

Duration 3 years.

Indigestion, no appetite, diffuse pain in the abdomen after meals and also in turning to the left in bed.

Total leucocyte count, 12,500 per c.mm., differential count nothing abnormal (no relative or absolute lymphocytosis).

Local examination detected a large nodulated lump in the ileo-cæcal region, slightly movable but very tender. Rectally, definite tenderness present towards the right side in the pelvis. Uterus freely movable.

Laparotomy:—A thickened cæcum was found with obvious tuberculous glands matted together along its medial side, but none in the mesentery. The terminal ileum for about 4 inches dilated and thickened to about three times the size of gut immediately proximal to it. Uterus and its adnexa normal. An attempt was started to remove the whole mass (considering that no diffuse scattering of tuberculous glands in the root of mesentery was visible to the naked eye), but the blood-pressure was at this time reported to be very low. Hence rapid closure of the abdomen was undertaken. The patient gradually sank and died the same evening in spite of routine attempts to pull her through with exhibition of stimulants and intravenous administration of glucose, gum acacia, saline, etc.

*Case 5.*—R. K., aged 20 years. Married, but no issue. Gurgling with pain in the abdomen. Duration 8 months. Lump palpable in the right iliac fossa, very tender, not movable. Laparotomy revealed the terminal 6 inches of the ileum thickened and congested, the cæcum, appendix and the region of the ileo-cæcal junction was one matted mass with obvious tuberculous glands; one gland removed and its tuberculous nature identified then and there by foci of caseation in it. Ileo-colostomy followed by marked relief, pain vanished, appetite regained. Left hospital happy after three weeks. Lump still felt in the ileo-cæcal region but no tenderness.

*Case 6.*—M. B. L., male, Hindu, aged 45 years. Disease of ten years duration, at first occasional attacks of colicky pain with intervals of six weeks or so. Later the intervals grew shorter. He said that for the last five years he had had attacks of pain nearly every week, each lasting 8 to 10 hours. He got his abdomen massaged 4 years before by someone who noticed for the first time a lump in the right iliac fossa. He suffers from constipation. Temperature about normal. Pulse 82 p. m. Laparotomy revealed matted and enlarged glands, pressing distinctly on the ileo-cæcal junction. The cæcum itself was thick, tough and fixed. The terminal 6 inches or so of the ileum revealed three patches (situated within 2 inches of each other) of peritonitis with evident miliary tubercles on them, indicating tuberculous ulcers inside. Ileo-colostomy done, followed by remarkable relief. He left the hospital relieved.

*Case 7.*—G. M. U., Mohammedan, male, 40 years. Treated for several weeks as a case of suspected typhoid fever, ending in acute, intestinal obstruction. When patient was received for surgical aid he was acutely ill. Absolute constipation, regurgitant faecal vomiting and diffuse abdominal tenderness marked by tympanites were noted.

Laparotomy, done under local anaesthesia, revealed extensive tuberculous adhesive peritonitis. Blood stained peritoneal fluid with *B. coli* odour. Interlacing adhesions with extreme distension of the upper jejunum compelled the performance of jejunostomy. The patient rallied and improved remarkably, the faecal fistula closing by itself. After about three months he developed severe diarrhoea and died.

*Case 8.*—Q. A., male, 50 years, married with children, non-vegetarian, occupation nil for about ten years, leading a retired life supported by sons, body well nourished.

Complained of:—(1) Pain and distension of abdomen. (2) Inability to pass faeces or flatus for 2 days before admission. (3) Regurgitant faecal vomiting.

Patient was questioned searchingly about any gastrointestinal disorder preceding present complaint immediately or more remote. He most emphatically stated (corroborated by his relative) that so far as his abdomen was concerned he had never experienced anything wrong about it. He claimed to have lived a perfectly healthy life, never affected by any trouble about digestion or pain in abdomen. Many such patients give no definite information about their antecedents, being poor observers, but his firm denial suggested insignificance of any discomfort occasioned by his abdominal condition previous to the present emergency.

Physical Examination.—Except for marked tympanites and distension, most marked in the middle of abdomen, feeble peristaltic gurgles heard on auscultation, nothing more of note could be elicited. External hernial regions unaffected. Rectal examination negative. Temperature 98°F. Pulse 132 p. m.

Treatment.—Exhibition of atropine, high rectal enema repeated half hourly and once done under chloroform with negative result.

Operation.—All cases of acute abdomen, provided they or their relations do not altogether refuse it, are given the desperate chance of an operation. The above patient was operated under novocain-adrenalin infiltration anaesthesia. (His stomach was washed out previously.) As soon as the peritoneum was opened it was found in an advanced state of miliary tuberculosis with the bowels matted. The abdomen was closed promptly with a tube tied into the most prominent coil of jejunum to relieve obstruction.

*Note:*—The last two cases were not of ileo-cæcal tuberculous but serve to illustrate tuberculous peritonitis cases met with in surgical practice.

The characteristic feature common in the clinical picture of all the above cases was pain in the abdomen.

*Nature of this pain.*—It comes on spontaneously, and is more or less intermittent, sometimes with an interval of days in the beginning, appearing immediately after meals or 5 or 6 hours after meals, is partially relieved by local pressure, escape of flatus or the passage of a motion; the nature of the pain is described variously as colicky, twisting, or gas pains. The duration varies from a few hours to 2 hours at a time, severe enough to make the patient take to bed and groan during its continuance. In one case the pain was aggravated on turning to the left side. The severity of the pain is only temporarily relieved by fomentations or enemata.

Local examination reveals some abnormality in the right iliac fossa. The abdominal wall movements in the right iliac region are comparatively sluggish. Pain and tenderness are present, deep palpation reveals either a nodular or glandular lump or an ill-defined swelling, or only a peculiar gurgle. This latter gurgle is of doubtful value though in all doubtful cases where the diagnosis of abdominal tuberculosis was established on the operation table this doubtful gurgle was made out by pressure over right iliac fossa in the previous history of the case. The same is also made out in undoubted cases of chronic appendicitis,



disease of the cæcum, entero-spasm, or even in the normal individual.

Among other signs and symptoms, loss of body-weight is suggestive if the patient is seen by a careful observer, diminished appetite is fairly common, nausea and vomiting are conspicuous by their absence. Distension of the abdomen is inconstant, and visible peristalsis has been noticed but rarely. The total leucocyte count varies between 6,000 and 10,000, with no marked cellular deviation from the normal ratio. It is not unknown for the abdomen to have been opened for some supposed mesenteric cyst or other lesion, when diffused or localised tuberculosis, peritonitis or tuberculous lymphadenitis or ulcerative tuberculous ileo-colitis has been revealed. Fever and an increased pulse rate are not present with any regularity or constancy sufficient to form an essential part of the clinical picture of such cases.

Having found a tuberculous abdomen, when least suspecting it, after laparotomy one is inclined to keep its probability prominently before oneself, when face to face with abdominal cases either complaining of chronic intermittent pain or lumps in the lower umbilical, right lower lumbar, and right iliac regions.

The comparatively younger age of the patient points to tuberculosis; after 45 or 50 such symptoms suggest malignancy. Pain in malignant disease or the ascending colon or cæcum is more constant, and cachexia becomes marked early. In malignant disease the lumps (glandular—of course late in the course of disease) are characteristically hard to feel. Diarrhoea alternating with constipation has been met with both in tuberculous and malignant disease. Rectal digital examination reveals in the majority of cases nothing in particular. A sense of vague discomfort which the majority of patients describe is of no help. Skiagraphy after a bismuth meal or opaque enemata, carried out in two other cases showed nothing characteristic in tuberculous cases, though, if utilised in all cases, it might prove of some value. The peritoneal effusion of fluid does not help as it occurs late in cancer, when the diagnosis becomes otherwise obvious by palpation of metastatic growths. In none of the above tuberculosis cases was any free fluid found.

Although in comparatively early cases the operative procedure may be decided upon beforehand, usually a surgeon has to determine the exact line of action after the abdomen has been opened. Then one of the following three pictures is most commonly met with.

(1) Diffuse tuberculous peritonitis or miliary tuberculosis of the peritoneum, with or without extensive adhesions in the ileo-cæcal region.

(2) An irregular fibro-fatty mass in the ileo-cæcal region involving the cæcum and variable lengths of the ileum and ascending colon:—hypertrophic (really pseudo-hypertrophic) ileo-cæcal tuberculosis.

(3) The terminal 4 inches to 6 inches of the ileum is found thickened and dilated. Externally it has a dull red colour, with or without depressed and scarred patches showing a few miliary tubercles on the peritoneal aspect, indicating ulcers situated on the corresponding mucous surface of the bowel.

This condition obtains in the adjoining cæcum for a variable distance, usually not in the whole of it. This condition has been more frequently met by us and is a combination of both forms of tuberculosis: "hypertrophic cæcal tuberculosis" and "ulcerative entero-colitis," though in our cases it was the termination of the ileum that was (pseudo) hypertrophied and also in some cases ulcerated.

In both types 2 and 3 glands varying in size and number were found affected in the ileo-cæcal angle and adjoining mesentery.

*Treatment.*—As the majority of our patients arrived in hospital in a very low state of vitality, they were treated by ileo-colostomy (with safeguards against causing intestinal obstruction). It was rapidly performed and the patient experienced very little shock and almost invariably a happy patient in bed was encountered the very next morning after the operation, and he or she remained so till discharged from the hospital.

In two other patients followed up for one year after operation, were found to be enjoying good health. It is exceedingly difficult to trace patients after discharge and to follow up their clinical history afterwards.

Excision of the cæcum is the operation of choice in the hypertrophic form if the disease be localised. The diffuse tuberculous involvement, including several inches of the ileum and matted up glands, combined with the low general condition, induced the decision to perform the comparatively mild operation of ileo-colostomy, with relief of symptoms.

Simple opening of the abdomen in tuberculous cases is accredited and known sometimes to be followed by considerable improvement. Oxygenation of the peritoneum is an added advantage. Rest is given to the affected bowel by the short circuiting operation of ileo-colostomy. If any large lumps of glands are noticed they may be removed with ease. The well known principles of treating tuberculosis patients in general, e.g., rest, fresh air, sunlight, good food, and tonics like calcium are adopted in treatment, in conjunction with the above surgical measures, to try to break the vicious circle of disease.

#### CONCLUSIONS.

1. There is at present a growing incidence of non-pulmonary forms of tuberculosis in the United Provinces.

2. Some cases clinically suggesting localised hypertrophic cæcal tuberculosis (tuberculoma of the cæcum) on opening the abdomen revealed tuberculous ulcerative lesions more or less well marked in or limited to termination of the ileum.

3. Patients present themselves late for surgical aid.

4. The milder operation of ileo-colostomy is attended with less shock than is excision of the cæcum, is perfectly well borne with relief, but the number of cases cited is too small to establish any standard method of relief.

5. The frequency of tuberculosis of the abdomen is to be kept in mind in dealing with doubtful abdominal conditions, acute or chronic.

### CARDIOSPASM.

By NISA NATH GHOSH, M.B.,

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"CARDIOSPASM" is a rare condition of the œsophagus, giving rise to its dilatation and to projectile regurgitant vomiting in many cases, and to dysphagia as well, in a few.

*Synonyms.*—There are numerous terms used for this condition—viz., cardiospasm, hiatal œsophagismus, functional hiatal stenosis, pre-ventriculosis, phrenospasm, etc. The one most commonly used is "cardiospasm." But unfortunately this is a misnomer. For (1) firstly, it is doubtful if there is true spasm at all in this disease; (2) secondly, the site of obstruction or spasm—whatever we may call it—is not at the cardia, but well above it, in the thoracic portion of the œsophagus; and (3) lastly, extensive dilatation of the thoracic portion of the œsophagus is a more marked feature of this disease than spasm.

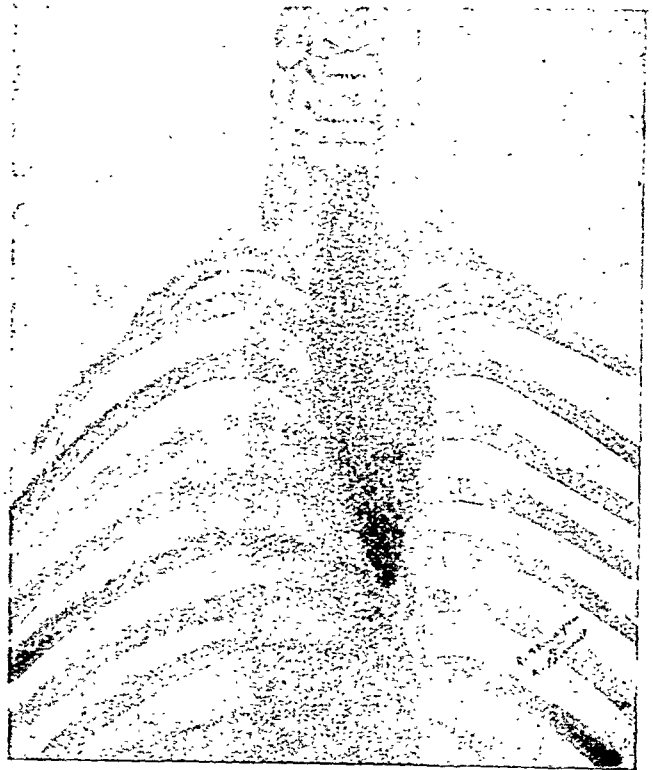
Further "spasm at the cardia" and "cardiospasm" are two quite distinct conditions. In "spasm at the cardia" there is temporary and transient obstruction. In "cardiospasm" there is more prolonged obstruction and along with it diffuse dilatation. In spite of these differences there exists an inter-relationship between the two. Most observers consider spasm at the cardia as an early condition often preceding and frequently ending in the more chronic condition of cardiospasm.

How is cardiospasm brought about? To understand this we must recall to mind a few physiological facts. Normally swallowing is a reflex act all throughout, except at the very beginning, when it is voluntary. The onward passage of a bolus of food through the œsophagus is brought about by the harmonious working of two sets of impulses—(1) one set passing along the vagus and causing contraction of the œsophageal musculature just above the bolus; and (2) another the inhibitory set passing along the sympathetic and causing relaxation of the œsophageal muscles below the bolus. The cardia and the portion of the œsophagus at the diaphragmatic opening are no exceptions and are influenced in the same manner as the rest of the gullet.

*The mechanism of its production.*—If a man with a full stomach is turned head downward

and heel upwards, he does not regurgitate his food. This as Dr. Jackson suggests is prevented by the "pinchcock" action of the diaphragm and the kinking of the abdominal portion of the œsophagus. This "pinchcock" opens on the approach of a bolus of food in normal swallowing, which is a reflex act except at the very beginning as already stated before. The late Sir William Osler believed that the so-called spasm in cardiospasm is nothing but the failure of the "pinchcock" to open on the approach of a bolus of food—i.e., a dissociation of the normal reflex mechanism of swallowing. Dr. McCrae is of opinion that all cases studied by Dr. Jackson and Dr. Clerf had obstruction at the diaphragmatic opening and not at the cardia. This opinion suggests two things—(1) that the site of the trouble is not at the cardia but above it, (2) that the "pinchcock" action of the diaphragm may play a part in the production of the so-called spasm.

*Signs, symptoms and diagnosis.*—The trouble complained of by patients may be a certain



amount of dysphagia for both solids and liquids in some cases, and projectile regurgitant vomiting.

The diagnostic features are:—(1) dysphagia more or less; (2) projectile regurgitant vomiting; (3) absence of hydrochloric acid and pepsin, blood and tissue fragments in the vomited matter; (4) absence of the second sound of swallowing on auscultation over the interval between the xiphoid and the left costal arch; (5) absence of pain and enlargement of cervical lymph glands; (6) the characteristic X-ray



picture after an opaque meal showing well marked dilatation of the œsophagus with a conical lower end, without any irregularity but with well defined and regular margins.

*Illustrative case and radiogram.*—These radiographic features as well as the fact that the seat of the spasm is well above the cardia were well seen in a case of cardiospasm which came to my notice some time ago. The radiogram of this case unfortunately got spoiled and spotted, so I had to get a drawing made of the radiogram. This drawing clearly shows the above mentioned features. A short note about the case is as follows:—

A patient, Aftabuddin, Mahomedan male, aged 22 years, came under my observation on 1st May, 1928, for dysphagia. The diagnosis was settled by X-rays which is the surest means of diagnosis nowadays in such cases. He was treated with bromides and atropine and finally discharged relieved on 16th May, 1928.

My best thanks are due to my students Sj. Krishna Kamal Bhowmick and Sj. Ratneswar Bhuyan, for the excellent black and white drawing they have made of the accidentally spoilt radiogram of the case.

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### EXPERIMENTS ON THE VITAMIN B (ANTI-NEURITIC FACTOR) IN PARCHED RICE; ON HONEY; AND THE MUCOUS SECRETION OF THE PIGEON'S MOUTH.

By S. N. MATHUR, M.B., B.S.,

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1. *Parched Rice.*—Some time ago, the author—(Mathur, 1928)—showed the superiority of parching over that of boiling rice so far as digestibility is concerned. The present observations show in addition that parching is not inimical to the anti-neuritic factor, vitamin B.

The experiments were carried out on pigeons. One batch was fed on polished rice, and the other on bazaar purchased parched grain (one set on *parmal*, and the other on *kheel*). Those which were fed on polished rice showed definite signs of polyneuritis in the third week, whereas there was no indication of it in the others, even after 46 days. Fig. 1 shows the appearance of one of these latter sets of pigeons on the last day of the experiment.

2. *Honey.*—Honey, as is well known, is held in considerable popular esteem for its health-promoting qualities. If this popular belief be true, it cannot be because honey contains any anti-neuritic vitamin. Pigeons fed on a diet of polished rice and honey developed polyneuritis even 3 or 4 days earlier than the controls fed on polished rice alone. These honey-fed pigeons

also were more lethargical, and suffered more severely from diarrhœa than the controls. This diarrhœa ceased some 36 hours before death,

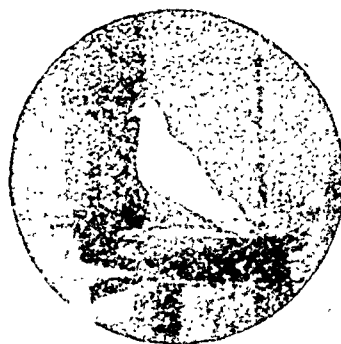


Fig. 1.

and was replaced by severe vomiting of a green coloured semi-fluid material.

At post-mortem there was found marked anæmia of the brain and spinal cord, and deep congestion of the abdominal organs. A very peculiar feature which was found regularly was an atrophy of the last three inches of the intestine, sharply demarcated from the neighbouring congested part.

3. *The Mucous Secretion of the Pigeon's Mouth.*—During the course of one of the above experiments, it was noticed that a young pigeon which was being fed by its parent on polished rice did not develop neuritis, whereas the other pigeon of the same brood which was feeding itself developed neuritis. This appeared to indicate some beneficial effect resulting from feeding by the parent. Accordingly, two young pigeons were taken from the same nest, and when they were able to feed themselves, one was isolated and allowed to feed itself, the other was isolated, given no opportunity to pick food, and continued to be fed on polished rice by its parent. The parent died on the 26th day, but the young pigeon remained well, and was then allowed to feed itself. Its nest mate, on the other hand, developed polyneuritis and was very ill at a time when the other bird seemed in full, vigorous health. Fig. 2 shows the difference at this stage between the two birds. The one on the left was fed by its parent.

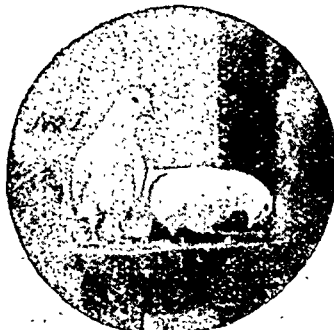


Fig. 2.

#### SUMMARY AND CONCLUSIONS.

1. Parched rice still contains a sufficient supply of the anti-neuritic factor.

2. Honey does not contain any anti-neuritic factor; it rather hastens the appearance of polyneuritis in pigeons.

3. Pigeons fed by their parents are more resistant to lack of the anti-neuritic factor than are pigeons separated from their parents immediately they are able to feed themselves.

In conclusion, I have to acknowledge my grateful thanks to Dr. W. Burridge for his invaluable advice, suggestions, and criticism.

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### VOLVULUS OF THE SMALL INTESTINE.

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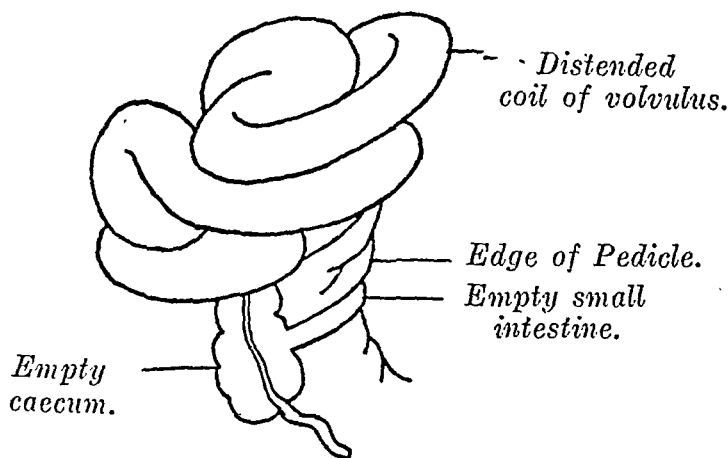
In Europe volvulus of the small intestine is a comparative rarity, but in India it is quite a common variety of obstruction. The writer has found it in nearly one-third of all cases operated on or examined post-mortem, and has heard other surgeons practising in India remark on its frequency. In a recent article in the *Indian Medical Gazette* Captain Ghosh(1) of the Darbhanga Medical School referred to it as the commonest variety of obstruction seen there.

observed an area of dullness towards the right side of the lower abdomen, corresponding to coils of affected intestine distended with fluid, as found at operation.

In contrast with cases reported in England the extent of bowel affected is usually considerable, sometimes the greater part of the small intestine; the lower limit is nearly always but a few inches above the ileo-cæcal junction. The severity of the torsion varies greatly; in a few cases congestion may be extreme and gangrene present, but more commonly congestion is slight, and hardly greater than in other forms of obstruction, the twist being enough to obstruct the bowel without greatly interfering with the circulation.

On first opening the abdomen one will find the blood stained exudate and congested bowel characteristic of volvulus in the more severe cases, but not in all.

In a large volvulus of the usual left to right variety on inserting two fingers one can generally detect a thick tense band of mesentery a little to the right of the middle line. This is the pedicle of the volvulus, and a finger may be passed round its left free edge and hooked behind it. When the parts are fully exposed, the cæcum and the lowest part of the small intestine are found to be empty, and if a finger is made to follow the empty coil upwards it winds round the left edge of the twisted mesentery and is lost to sight. In the milder cases the parts are so loose that it is difficult to believe that one is really dealing with a volvulus. But on tracing



*Diagrammatic Representation of the formation of pedicle with small intestine winding round its free edge.*

These cases have no distinctive symptomatology by which they can be distinguished from other cases of small intestine obstruction. A history of eating some coarse indigestible food such as gram, or of straining at work at stool is common; the onset is usually sudden and the pain very severe. The writer has sometimes

the empty bowel upwards it is found to be continuous with the distended bowel above, and on rotating the whole mass in a clockwise direction the empty ileum and cæcum fill. This and the ultimate recovery of the patient, which usually follows in this type of case, is a satisfactory confirmation of the diagnosis, but unless the

nature of the obstruction is recognized by the foregoing manipulations it is quite possible to reduce the volvulus without knowing it, and to waste valuable time in searching for an obstruction which no longer exists. It may be that the cases one sometimes hears of in which no organic obstruction could be found at operation may be of this nature.

One might suppose that spontaneous reduction might occur in some of these cases, and the writer has published two cases in which there was the strongest evidence that this had happened. In one the patient died of collapse shortly after the bowels had been opened, and bruising and ecchymosis was found in the bowel and mesentery with such a distribution that a recent volvulus was the only possible explanation. In another case the patient had a stricture of the intestine.

The small intestine was scarred and adherent to the mesentery in just such a manner as would result from a previous volvulus and there was a history of a previous attack of obstruction corresponding with this. This scar had contracted until a stricture was produced.

Treves(3) remarks that the twist is sometimes very slight, only half a turn, and that at post-mortem when the contents of the affected bowel were allowed to escape and the distension relieved the obstruction in one case disappeared.

In Europe recovery from acute obstruction (which is not merely an episode in a case of chronic obstruction) is extremely rare apart from operation. But in India, if the many cases which refuse operation are treated with repeated high enemata, a surprisingly large proportion—perhaps one in eight—will be relieved, sometimes not until as many as four enemata have been given. It is difficult to imagine what has happened in such cases, but if it be conceded that volvulus of the small intestine is common in India, and that it is specially favourable for spontaneous reduction, we have an explanation to hand for some at least of them.

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### FRAMBOESIA TROPICA IN BENGAL.

By B. C. MUKHARJI, M.B., D.P.H.,

Bengal Public Health Department.

A DISEASE locally known as *myang* was reported for the first time in February 1927 by Babu Rehati Mohan Dutta, M.A., Subdivisional Officer of Ramgarh, to be spreading among the hill tribes of his subdivision. Mr. C. G. B. Stevens, I.C.S., Deputy Commissioner of the

Chittagong Hill Tracts, reported the extreme prevalence of the disease at Ramgarh on the Feni river and requested the Director of Public Health in August 1927 to carry out investigation and treatment. The late Dr. L. M. Ray, then Civil Surgeon at Rangamati, and myself, then Officiating Assistant Director of Public Health, Dacca and Rajshahi circles, investigated the disease in September 1927 and reported that the disease was yaws (frambœsia).

The disease is characterised by two stages; (1) the stage of primary lesions and (2) the stage of secondary granulomatous eruptions. The disease is prevalent mostly during the rainy season. In winter in some cases it runs a latent course, only to reappear in the following wet weather. The disease runs an indolent course from one to four or five years. Spontaneous recovery has been recorded after a prolonged period of suffering. So it seems that immunity from the disease develops very slowly. The primary lesions may appear as an ulcer or as a papule, which soon breaks into an ulcer. Primary ulcers have been found on the genitalia but they may be extra-genital. (During the investigation female patients were not thoroughly examined as there was no nurse attached to the dispensary to attend the patients). About three months after the appearance of the primary ulcers, which have not the characteristic hard feeling of a Hunterian chancre, there is a feeling of malaise and rheumatoid pains in the joints. The pains precede characteristic eruptions on the skin. The pains may be so severe as to confine the patient to the bed. There is no arthritis. The pains subside on the appearance of eruptions. The papules appear on the skin and break down, forming ulcers with clean-cut edges and granulating bases. In some cases the papules grow into small warty tumours which break down and form unhealthy looking weeping ulcers with clean cut edges. Ulcers of the size double that of a rupee have been found in some cases. The neighbouring lymph glands become enlarged, but like syphilitic glands have never been known to suppurate. Bilateral enlargement of the inguinal glands was found (in the patient Iswar Chandra, Tippera). The ulcers run a prolonged course and on healing leave pigmented patches. The eruptions do not come out in one crop. Warty growths appear in succession one after another. Joint pains are generally not present when these supplementary growths appear. Warty growths have been noticed in the anus. The skin eruptions have no selective distribution. There is no involvement of the internal organs. In only one case (Iza Ram Das) necrosis of the nasal bone and falling of the bridge was noticed. The patient denied a history of syphilis. It is still very doubtful if the necrosis of the nasal bone in this case was really due to yaws. Possibly it was the result of a previous syphilitic infection. Dr. Tarananda Mukharji, M.B., D.P.H., then District Health Officer of Chittagong, supplied

the following blood picture of *myang* disease (yaws):—

	Per cent.
Polymorphonuclear leucocytes ..	56
Lymphocytes ..	37
Large mononuclear leucocytes ..	5
Eosinophiles .. ..	2

*Treponema pertenue* has been reported to be the causal agent in these cases. The disease is spread by local infection by contact and through dirty habits.

The disease can be differentiated from syphilis by the following points:—

(1) The chancre or primary ulcer lasts much longer than that in the case of syphilis.

(2) In the prodromal stage of secondary eruptions on the skin, there is articular pain and absence of fever.

(3) Subsidence of the joint pains when the eruptions on the skin appear.

(4) The nature of the eruptions on the skin.

(5) Absence of involvement of the internal organs. The disease is mostly located in the skin.

(6) Congenital propagation of the disease has not been traced (among the cases investigated).

The incidence of the disease in a few villages and its position in 1927 was worked out by me, and was as follows:—

Locality affected.	Villages.	Population.	Total number of patients.	Incidence per 100 population.
Feni valley .. ..	Barakala ..	100	15	..
	Kalapani ..	100	16	..
	Sadarkhil ..	120	15	..
	Ramgarh ..	560	55	..
	Daiseri ..	130	15	..
TOTAL FOR FENI VALLEY ..	..	1,010	116	11.5 per cent.
Chengi valley .. ..	Khagracherry ..	700	100	14.0 per cent.

Mr. A. S. Hands, I.C.S., Deputy Commissioner, Chittagong Hill Tracts, reported in November 1928 that the results obtained last year were so satisfactory that the deputation of a touring Sub-Assistant Surgeon for the next three months might result in stamping out the disease. The Civil Surgeon has since reported that the prevalence of the disease has comparatively subsided and only a few cases now come occasionally to the Ramgarh and Manickcherry dispensaries.

*Spread of the disease.*—The disease is prevalent in the Ramgarh subdivision and also in the Tippera Raj Estate. It first appeared in the area about fifteen years ago when an elephant trap (*khedda*) was constructed by the estate. The trap was maintained for a long time and it is believed that the Magh people from Burma and the people from the Lushai Hills were present among the labourers. It was then that yaws (locally known as *myang* or elephant disease—so called from its association with the elephant trap) was noticed among the people for the first time. So it seems that yaws was imported into the area from Burma by people coming from yaws-affected districts in Burma. Yaws is widely prevalent in the Chin Hills in Burma and in the Assam Valley. It has also been reported by Dr. Ramsay to be prevalent among the hill tribes of Cachar. Dr. Muir has recently discovered the same disease in Bengal, on the Birbhum border line. Dr. Ramsay contends that yaws was first introduced into Assam from Burma via the hill tracts and it has now

Neosalvarsan effects a speedy cure. One injection of this remedy or similar derivatives is often sufficient to heal the ulcers, but relapse of joint pains has been recorded after one injection of neosalvarsan. Further investigations are necessary to ascertain the exact dosage of the remedy that would effect a permanent cure. Seventy-one cases were treated by me during the course of my investigation. The Sub-Assistant Surgeon of the Ramgarh dispensary treated cases coming to the dispensary. A Sub-Assistant Surgeon was then deputed to carry on the treatment of the disease, and 673 patients were treated in 1928 with the specific remedies.

spread to the Bengal-Bihar border line. The same disease was traced by Dr. Tarananda Mukharji, M.B., D.P.H., in March 1928 to have penetrated into villages in the extreme north of the Chittagong district, and he thought that the disease had spread from the hill tracts to the villages of Chikomia, Barabit, Koila, Adharia, and Datma in the Fatikcherry police station of the Chittagong district.

All District Health Officers should keep an eye on the appearance of the disease in their respective areas and should report to the Director of Public Health the first case that they come across.

\* THE FOOD VALUE OF THE NUT OF  
*ANACARDIUM OCCIDENTALE* (HIJLI  
BADAM).

By N. K. CHATTERJEE, B.Sc.,

Assistant Analyst, Public Health Laboratory, Bengal.

*Hijli* nut (Cashew nut of Bengal) or *Hijli Badam* of Hijli, Midnapur, generally known as *Kaju* on the east and west coasts of India, is a native of tropical South America, whence it was introduced into India by the Portuguese some time in the 17th century in their Goa territory; and even up to the present day it is nowhere so abundant as in the western coast of this country. It has, however, become thoroughly naturalized now throughout the coastal regions of India, extending from Burma to Bombay. Consequently it is also found established in the coastal sandy tracts of Hijli and Chittagong in Bengal, whence it has derived the name of *Hijli Badam*. In South and West India it is known as *Kaju*, adapted from the South American name *acajou* which by French transliteration has been rendered into Cashew nut; since then it has been in use as a nutritious food, more specially as a fatty food. In Bombay there is an extensive trade in this nut exported from Goa. The Calcutta market is also supplied from South India. Sir George Watt(1) says that the kernels are so extensively eaten that unless more nut is produced it is almost impossible to manufacture sufficient oil for any trade purpose. He recommends the extension of its cultivation on the ground that it will form a supplementary staple food. Dymock(2) suggests that the coastal forest region and barren sandy tracts can be utilized for its cultivation with little or no difficulty. Recently a correspondent from Hijli writes in a literary periodical about the demand for the nut, and earnestly suggests that the greatest efforts should be made to extend the cultivation of such a useful plant in the unused vast sandy tracts of the coast of Bengal, to secure an inexhaustible supply of wholesome food.

**Identification.**—As regards identification it cannot be confounded with *jungli badam* which is generally found in western and southern India, the seeds of which yields a large percentage of oil; this tree, *Sterculia fetida* (L)(1) belongs to the genus *Sterculia*, natural order *Sterculiaceæ*. It has not much importance as a food, but in times of scarcity the seeds are roasted and eaten like chestnuts. The tree we are dealing with, however, is *Anacardium occidentale* of Linneus(3) or the *Hijli Badam* of Bengal. It belongs to the natural order *Anacardiaceæ*, genus *Anacardium*, species *A. occidentale*.

It (Fig. 1)(4) is a tree, 20 to 30 feet high, with short crooked trunk, and the branches are quite glabrous and terete, leaves thick, coriaceous, about 4 inches to 6 inches long and  $2\frac{1}{2}$  inches to 3 inches broad, obovate or elliptic, rounded at the

apex, glabrous with finely reticulated veins, the base cuneate; main nerves 10 to 12 pairs, prominent beneath, petioles short and thick, not exceeding  $\frac{1}{2}$  inch in length. Flowering panicles terminal, longer than the leaves, with branches

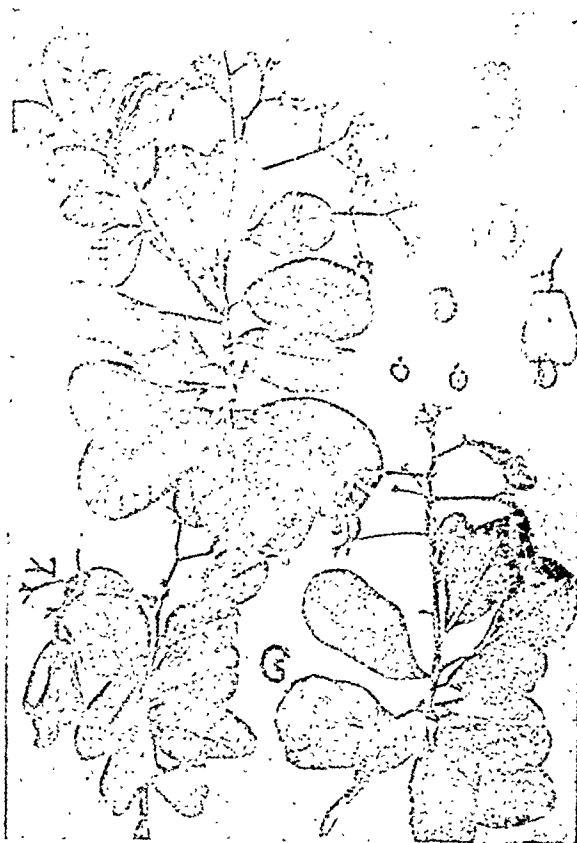


Fig. 1.—*Anacardium occidentale*.

cymose, bracts  $\frac{1}{2}$  inch to  $\frac{2}{3}$  inch long, ovate, very acute-nerved, finely puberulous, on the outside; peduncles lengthening with age. Sepals  $\frac{1}{2}$  inch long, lanceolate, puberulous on the outside; petals  $\frac{1}{2}$  inch to  $\frac{3}{4}$  inch long, linear, lanceolate, deflexed from the middle, minutely puberulous outside; stamens about 9, one longer than the other, exserted beyond the recurved petals. Ovary about  $\frac{1}{2}$  inch long, glabrescent, attenuated into a subulate style  $\frac{1}{4}$  inch long. Fruit (Fig. 2) kidney shaped, about 1 inch long and nearly as broad, with a thickness about  $\frac{1}{2}$  inch, greyish brown, inodorous; its pedicel thickened and, on maturity, fleshy, coloured like an apple yellow and red, reaching the size of a medium sized pear(5). A native of Hijli, Bengal, it grows on the east and west coast of India. This is the only species out of six known in tropical America, which has been introduced into this country.

**Limits of Cultivation.**—There is no difficulty in its cultivation, neither does it cause any local disadvantage; mature seeds are simply placed under the wet sand during the rainy season; its cultivation is limited only to sandy coastal tracts, beyond which its growth is not favourable.

**Economic Value.**—While keeping in mind that though there is no existence of any trade in the nut at present in Bengal, owing to its production in very small quantities, quite insufficient for the

\* Being a paper read at the Indian Science Congress, Madras, in January, 1929.

purpose, yet we must not forget the fact that an extensive trade in this nut is carried on in Bombay by import from Goa, the price of 1 cwt. being not less than Rs. 18. In Hijli, nuts are sold at Rs. 10 only per maund, for the outside market the price may be higher according to its demand. The weight of the kernel of each nut is from 0.9 to 1.5 gm. About 60 plants can be grown in an acre and if the least quantity of crop be 2 maunds per tree, the harvest will amount to over

The kernel of the raw nut is also used and a large percentage of oil is obtained from it. Fresh nuts show traces of anacardic acid and cardole in the kernel, the presence of which makes the kernel not so palatable as the roasted one; hence for flavour and palate the roasted nut is preferred. The nut contains all the proximate principles of food. The table given below gives the composition of the kernel of the raw and roasted nut as found from actual analysis:—

Kernel from different sources.	Water.	Protein N × 6.25	Fat.	CARBOHYDRATES.			Fibre.	Ash.
				Starch.	Soluble carbo- hydrates.			
Raw { Minimum ..	9.5	14.5	39.0	6.5	3.5	..	4.5	2.05
Maximum ..	22.0	16.25	42.5	7.4	6.5	..	6.5	3.07
Average ..	19.0	15.8	41.8	7.0	5.0	..	6.0	2.7
Bazar sample { Minimum ..	5.9	18.6	35.0	6.7	4.5	..	6.0	2.35
so-called roasted { Maximum ..	7.0	28.6	40.9	9.0	6.5	..	11.0	4.0
Average ..	6.5	23.6	40.0	8.0	5.5	..	8.5	3.17
Constituents of milk (cow)	87.53	3.18	5.27	..	..	4.32	..	0.7

120 maunds of nuts, which at Rs. 10 per maund means about Rs. 1,200. The peduncles also of the matured nut are sold as *Lanka Am*; from its sweet juice a kind of weak spirit is available

The last column, being the averages of the value of several cow milk samples, shows the percentage of food principles of milk as against those of the nut. In protein the raw and roasted samples are richer 5 and 7 times respectively; in fat they are about 8 and 7 times respectively; and in digestible carbohydrate both are 3 times richer than that of milk. The total calories per 100 grams of nut is 670.0 against 66.72 calories per 100 gms. of milk, i.e., the former is ten times higher than the latter. The mineral contents in the nut are about 4½ times more than that of milk. The following table shows the percentage of different bases and acids in the ash of the nut against those of the milk.

	Hijli nut.	Milk(6).
K <sub>2</sub> O	7.2	24.5
Na <sub>2</sub> O	29.7	11.0
CaO	2.31	22.5
MgO	1.25	2.6
Fe <sub>2</sub> O <sub>3</sub>	1.75	0.3
MnO	1.0	..
P <sub>2</sub> O <sub>5</sub>	14.7	29.5
SO <sub>3</sub>	3.0	1.0
Cl	0.5	15.6
SiO <sub>2</sub>	3.61	..

Fig. 2.—Fruit.

which will also fetch some price. In addition to the fruits the tree yields a gum in large stalactitic pieces, tannin from the bark, and the juice by incision of the bark for dyeing net, ropes, etc.; lastly, a durable wood is available from the trunk.

*Food Value.*—Generally the kernels of roasted or well-dried nuts are eaten or used in confectionery.

So one pound of nut will be equivalent to 10 pounds of milk in energy value, with 1/20th part of phosphorus, about half the quantity of iron, 1/30th part of potash, 1/3rd of soda. The kernels of the nut are mostly used in the preparation of vegetable curry, and Indian sweetmeats and cakes, like other food-stuffs containing fat, such as ground nut, almond and walnut for making the preparation more tasty. The nut is a food

of the fatty group and compares favourably with such foods as ground nut, almond, walnut, etc. The comparison is as follows:—

mentioned in Sir George Watt's *Dictionary of Economic Products* that the finest oil is superior to olive oil and the equal in every respect to

	HIJLI NUT.		GROUND NUT(7).		Almond, dried.	Walnut kernel as sold in the market.
	Raw.	Roasted as sold in the market.	Raw.	Fried.		
Moisture ..	19.0	5.35	26.13	4.2	5.4	4.6
Protein ..	15.35	23.6	26.13	24.2	24.2	15.6
Fats ..	41.0	40.0	43.81	47.2	53.7	62.6
Carbohydrates ..	12.0	13.5	13.68	8.0	7.2	7.4
Ash ..	2.56	3.17	1.58	..	2.9	2.9

It is almost as nutritious as ground nut, almonds and walnut, except for being a little inferior to them in fat value, but in digestible carbohydrate and mineral matter it is superior.

In Fig. 3 a photograph of the starch found in the nut flour is given; the characteristics of the granules being that they are irregular in size with

almond oil. From the nature of the oil it is not inferior to ground nut and mohua oil as a substitute for ghee or as an adulterant of the latter. Also it may be used as a substitute for almond oil if a fine preparation is made. The comparative figures of chemical analysis of oils are given below.

Oil.	Sap value.	Iodine value.	R. W. value.	Butter Ref. Reading.	Specific gravity.	INSOLUBLE FREE FATTY ACID.	
						Titre test.	Melting point.
Hijli nut ..	188—192	81—88	0.5—0.9	53—55	0.918	31.5	36.5—37.5
Ground nut ..	185—195	85—94	—	54—56	0.917	30.5	36.0
Mohua ..	186—194	58—64	1.6—1.7	50.5	—	—	—

a diameter 3.4 to 9.0  $\mu$ , with no concentric rings, oval, having elongated hila at the centre, lengthwise a little bent. The most important nutrient in the nut, however, is the oil from its kernel. It is a yellow bland oil, but when the oil is pressed

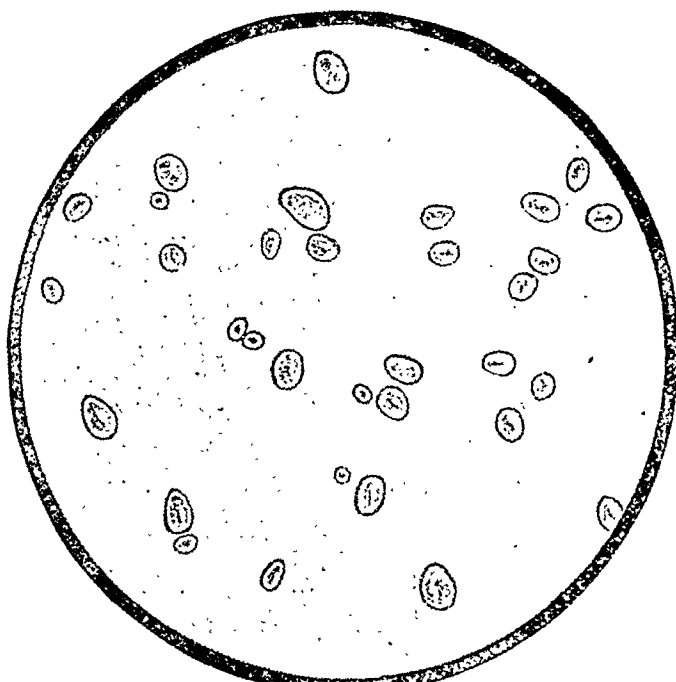


Fig. 3.—Starch Granules of Hijli Nut Flour.

out of a machine it becomes brownish yellow, probably on account of the kernels not being thoroughly cleaned off their testas. It is

The oil congeals below 10°C.; with sulphuric acid without agitation a brown ring forms between, but after mixing it becomes a thick red mixture; with cold nitric acid it becomes a hazy deep orange colour; when heated with acid the orange colour deepens. Bellier's test gives a positive reaction for this oil (the temperature at which turbidity occurs being about 25°C.) which shows the presence of arachidic acid in the oil. The action of bromine on the thin film of oil has been examined; the bromine value has also been directly estimated, and is 53 to 55. The characteristic of the brominated film is seen under the microscope.

The film (Fig. 4), as shown, is slightly wrinkled with translucent droplets. To the naked eye it is soft, sticky, but often tends to run into streaks and lakes rather than to remain even.

Oil from the pericarp is thick, dark brown, having a specific gravity of 1.014 (Lepine), it chiefly contains cardole and anacardic acid. The oil is recommended as an external application in leprosy, ringworm, corns, and obstinate ulcers. It is powerfully rubescent, vesicant and an insecticide and requires to be used with caution.

*Influence on Nutrition.*—Feeding experiments on rats have been started some time ago with a view to gauging its nutritive value. Satisfactory results are being obtained. Young rats are growing as usual on an exclusive *Hijli* nut diet, both raw and roasted. They appeared quite active and gaining in body-weight. These experiments are in progress.



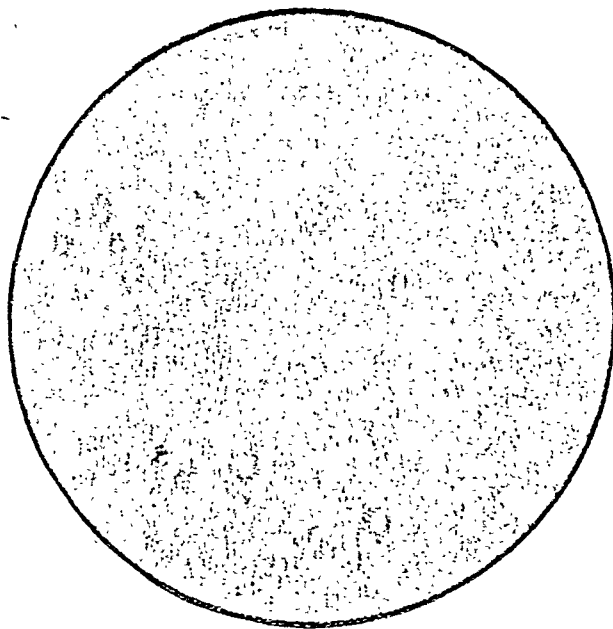


Fig. 4.—Brominated Film of the Oil.

A comparison of the extent of nutrition can be roughly drawn from Chart I in which the dotted line indicates the weights gained by the control rat on mixed diet, and the continuous line is that of rats on an exclusively nut diet during the short period they were under observation.

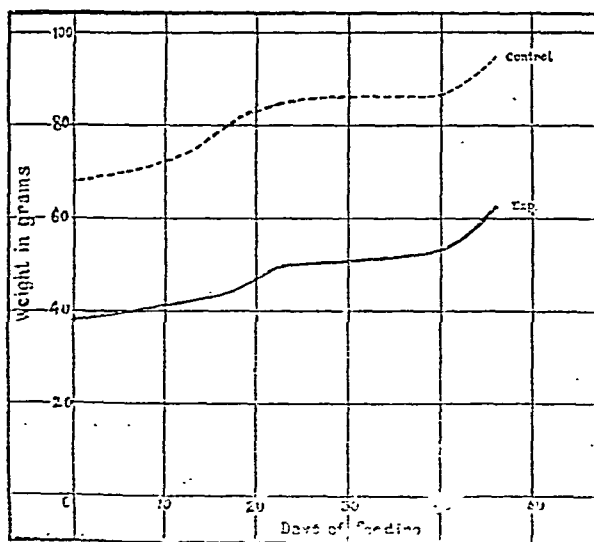


CHART I.

The curves are to all practical purposes parallel, showing that nutrition is almost the same in both cases.

**Conclusion.**—The fruit of *Anacardium occidentale*, the *Hijli Badam* of Bengal, grows lavishly in coastal sandy tracts and ridges, and the vast area of the coastal forests can be utilized for its cultivation. It is a really nutritious food and is unique as a supplementary staple food. It should not, however, be confounded with *jungli badam* which is neither so tasty nor commonly used for eating. It is rich in proteins, fat, iron,

phosphorus and other mineral salts which are so essential for the growth of the body.

*Hijli Badam* also yields a large percentage of edible oils which can be used as a substitute for ghee, and also as a substitute for almond oil on account of its soothing properties, and at the same time on account of its cheapness. Moreover the cardole has got various uses in external application as a medicine and for other domestic purposes.

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- (3) Linneus. *Syst.*, p. 129.
- (4) G. Capus et D. Bois. *Produits Colonieux*, p. 192.
- (5) Cooke. *Flora of Bombay*, Vol. I, p. 274.
- (6) Thorpe. *Dictionary of Applied Chemistry*, Vol. IV, Milk.
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## A Mirror of Hospital Practice.

## BILATERAL TORTICOLLIS.

By S. K. GUPTA, M.B.,

Halara, Jamalpur (Burdwan).

ABOUT a fortnight ago, I was called in to see a case at a distant village having the history of sudden turning back of the head, which occurred at about 12 noon on that day.

On arriving there at about 5-30 p.m. I saw a young healthy lady of 15 or 16 years, lying on her dorsal decubitus with her eyes open and head turned backwards.

She had been silent since the noon (as relatives said) but, on hearing that a doctor had come to treat her, she began to abuse me in bad language and exerted her whole strength to prevent me from examining her. However, I examined her thoroughly with the help of her relatives.

On physical examination no other abnormality but rigid contraction of the neck muscle was found. Pupils were equally and moderately dilated (due to semi-darkness in the room) reacting normally with light. Sense normal (closing her eyes if fingers are put there); the patient was conscious.

No history of hysterical fits or any other disease. Her relatives and other villagers on seeing her abusing me in this way, believed that she was caught by a *ghost* (*Bhut*) and requested me not to give her any medicine; and they wanted to drive the ghost (*Bhut* in Bengali) away by chanting sacred hymns (*mantras*).

But without listening to them I gave her an injection of morphine with atropine, a purgative containing calomel and a mixture containing hypnotics. I asked them not to disturb the patient from her sleep by chanting *mantras* and told them "if they do so the patient may die." Through fear, they did not venture to chant any *mantras*.

She had a very sound sleep during the night, followed by complete disappearance of all her symptoms in the morning. The relatives and villagers were greatly astonished to see that doctors could drive away ghosts with medicine more quickly than their *mantras*.



## A CASE OF BLACKWATER FEVER.

By K. G. NAIR, L.M.P.,  
Medical Officer, Balliguda,  
and

S. RAJU, L.M.P.,  
Malah Reserve Medical Officer, Balliguda.

AN Indian Christian girl, aged 15 years, a temporary resident of the Agency Tracts for a continued period of 6 years, very often subjected to malaria, had in the beginning of April an usual attack of fever which subsequently turned out to be blackwater fever. The history revealed that all the previous attacks were treated with some antipyretics or other, excepting the specific drug quinine which was resorted to very sparingly whenever the attack proved to be protracted and persistent. This last occasion was no exception to the rule. A purgative followed by aspirin and a diaphoretic mixture was used but the fever continued without response until the evening of 4th April, 1929. Then on the advice of the doctor 5 grains of quinine hydrochloride were given. Next day 10 grains were given with the result that the temperature came down considerably, enabling the patient to move about freely. At about 7 p.m. on 5th April, 1929, the girl while passing urine noticed the colour of it to be very dark. Fortunately a receptacle was used, and so that the doctor when summoned, was easily able to detect the signs of blackwater fever. Immediately the girl was confined to bed, and extract cassia beareana liq. was administered in hourly doses of 10 mins. Next day at about 10 a.m. pains in the loins started, which increased in gravity every minute, making the poor girl very restless and roll in the bed. Fomentations, pressure, and counter irritants did not mitigate the pain. The urine continued to be of the same colour and consistency, but the quantity became less. A hypodermic injection of morphia was given after some consideration. Much to the relief of the girl after a lapse of about half an hour the pain became bearable. Plenty of bland liquids and thin Horlick's malted milk combined with the mixture were given. Next day at about 9 a.m. nausea of a very bad type started which subsequently developed into vomiting. Every time green cheesy matter with some liquid was being brought out. Gastric sedatives which were attempted one after the other gave no relief. The patient became very exhausted, the pulse became rapid and feeble, and the temperature shot up to 103°F. Delirium started and the patient began sinking; this disheartened the relatives, not to speak of ourselves. Now the mixture containing cassia beareana was suspended and Sternberg's mixture in the doses suggested in *Manson's Tropical Diseases* was started. After a few doses of the mixture had been retained the nausea abated, allowing the girl to rest in short naps. This mixture was continued uninterruptedly, an ounce every hour, along with the diet and plenty of water. The next urine exhibited a definite change in the colour, consistency and volume. Gradually on the third day after the use of the second mixture the urine is cleared. On 10th April, 1929, i.e., the sixth day, an enema of soap and warm water was given, which further relieved the patient a good deal. By this time the temperature had come to normal. On 11th April, 1929, the mixture was suspended and the patient put on quinine. This was given in capsules in the form of hydrochloride in doses of 10 grains for over six weeks. Towards the end of June she was removed to a station on the plains. There was no trouble in the meanwhile excepting for an attack of gastritis.

Certain points of interest in this report of the case are, (1) the development of the attack after a long stay of 7 months in this part of the Agency which is not an endemic area, (2) a very reliable history of irregular dosing of quinine, (3) advantage of the Sternberg's mixture over cassia beareana liquidum and (4) advantage of starting quinine sufficiently early soon after the active period of the disease passes off.

Our thanks are due to Major F. R. R. Carreck, L.M.D., our District Medical Officer, for his kindness in reviewing and permitting us to publish this.

## A SEVERE CASE OF OSTEOMALACIA.

By CAPTAIN R. P. GHOSH, M.B.,  
Deputy Superintendent and Teacher of Surgery,  
Darbhanga Medical School, Laheriasarai.

ON the morning of the 13th May, 1929, I was asked to see a Hindu woman, aged about 25 years, with the following history:—

She was six months' pregnant. Five days before she had had a fall followed by uterine hæmorrhage. A number of country *dais* were consulted and they decided to remove the fœtus as it was dead. They all tried to extract it, but to no effect. I examined the patient and found the following:—

A thin small woman looking desperately ill. Unable to extend the lower limb. Pulse, 140; respiration, 20; and temperature, 97°. Tongue, dirty and dry. Uterus up to the level of umbilicus. Through the vagina was coming out some pus-like fluid with an offensive smell. I found she was suffering from severe osteomalacia and, on attempting to make a vaginal examination, I found that the outlet hardly admitted my forefinger. Not being able to decide what to do under the circumstances, I consulted my chief Dr. S. M. Livesey, M.B., F.R.C.S., and he decided on hysterectomy, but, as the patient was in a bad condition, we decided to wait until there was some improvement. We gave her the usual restoratives, saline glucose *per rectum* and repeatedly douched out the vagina.

Next morning her pulse rate was 146 and temperature 97°. Dr. Livesey decided to perform a rapid hysterectomy, and so I gave her a breast saline. Under ether anaesthesia, the usual hysterectomy was performed, and both ovaries were removed. It took just 15 minutes from the time the skin of the abdominal wall was incised to the last stitching. Shortly after the operation the patient started showing signs of improvement and she made an almost uneventful recovery. A month later she left the hospital apparently a different woman altogether. It goes without saying that but for the rapid hysterectomy the patient could not have survived.

My best thanks are due to my chief, Dr. Livesey, for permission to publish this case.

## A CASE OF PNEUMONIA TREATED BY "PNEUMOCOCCUS IMMUNOGEN (COMBINED)."

By MAHENDRA KUMAR BATTACHARYA,  
Medical Officer, Bengal Police Hospital, Alipore.

THE patient, a male, aged 23 years, was first admitted into this hospital on 30th December, 1928, with complaints of dyspepsia and was treated accordingly up to 23rd January, 1929.

On 24th January, 1929, he suddenly complained of pain in the right side of the chest with rise of temperature up to 104°F., dyspnoea and restlessness. The chest was carefully examined, but nothing particular was found except harsh breath sounds on one side. The patient was placed on alkaline mixture and rest. The respirations were 24 per minute.

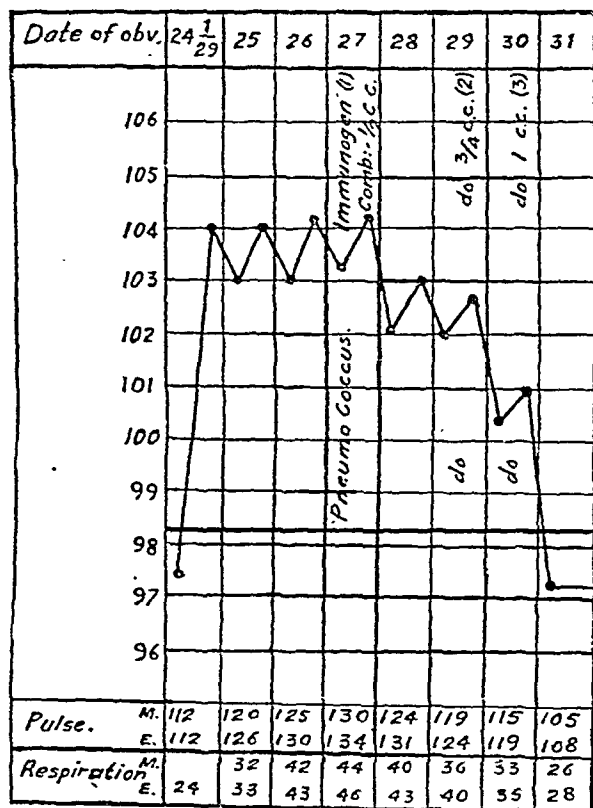
On 25th January, 1929, the temperature was between 104°F. and 103°F., and this was associated with a dry hacking cough and scanty expectoration. The previous signs and symptoms were pronounced. The respiration was 32 and pulse was 120 to 126 per minute. Fine crepitations were audible in the lower half of the right side of the chest, vocal fremitus was increased and dullness was also detected, and the patient was slightly delirious: A complete blood count was done and the result was as follows:—

Hæmoglobin ..	.. 66 per cent.
Erythrocytes ..	.. 3,200,000 per c.mm.
Leucocytes ..	.. 25,000 per c.mm.
Polymorphonuclears ..	.. 90 per cent.
Lymphocytes ..	.. 7 per cent.
Large mononuclears ..	.. 3 per cent.
Eosinophiles ..	.. Nil.

The alkaline mixture was continued 4 times a day. Calcium lactate, grs. x, twice daily for 48 hours was given and Antiphlogistine applied to the chest. Pneumococcus immunogen was withheld until the diagnosis of lobar pneumonia could be definitely established.

On 26th January, 1929, no improvement of the patient was found, but signs of toxæmia were pronounced; the patient was more delirious and respiration much increased and difficult, i.e., 42 per minute. The pulse was full, soft, and very frequent, i.e., 125 to 130 per minute, and the patient was more restless. The dullness had increased. The temperature was running between 103 to 104.2°F.

On 27th January, 1929, an intramuscular injection of pneumococcus immunogen (combined) in  $\frac{1}{2}$  c.c. dose was given at 4 p.m., in addition to the medicine prescribed previously. Besides, he was given rum in drachm doses, 4 times a day, and digifortis 3 times a day in 10 minim doses. The temperature was running between 103.4 to 104.4°F.; the respiration was 44 to 46 and the pulse rate was 130 to 134 per minute.



On 28th January, 1929, the signs and symptoms were less pronounced, the temperature was running between 102°F. and 103°F. The patient was less delirious and less restless. Respiration was 40 to 43 and pulse 124 to 131 per minute. He complained of less pain. The same treatment was continued except the pneumococcus immunogen.

On 29th January, 1929, the temperature was running between 102°F. and 102.6°F. and the general condition of the patient was much better. The same medicine was continued and a second dose of 0.75 c.c. of pneumococcus immunogen (combined) was injected intramuscularly. Respiration was 36 to 40 and pulse was 119 to 124 per minute.

On 30th January, 1929, the temperature was running between 100.6°F. and 101°F., the respiration was less difficult—i.e., 33 to 35 per minute—and the condition of the pulse was much improved, i.e., 115 to 119 per minute. There was no delirium. The chest was examined and moist ronchi were audible. There was slight rusty expectoration. In order to observe the case I had to give him at 8 a.m. the 3rd dose of 1 c.c. of pneumococcus immunogen. The temperature next morning came down

to 97.4°F. He was then placed on stimulant cough mixture and stimulant mixture, digifortis 3 times a day for 48 hours—then a stimulant cough mixture and subsequently an iron tonic were continued for some time. He had no rise of temperature till the 7th February, 1929. Respiration was 26 to 28, pulse was 105 to 108.

But on the following day (i.e., on the 8th February, 1929), he had a slight rise of temperature 99.2°F. Probably this rise of temperature was due to some more diet having been given to the patient. Since then he had no rise of temperature and his general condition gradually improved and he made an uninterrupted recovery subsequently.

The case is an example of the effect of immunogen on the course of the disease.

The improvement in pulse rate and general condition was very marked from the beginning of the treatment.

I thank Lieut.-Col. A. Denham White, I.M.S., Civil Surgeon, 24-Perganas, for kindly permitting me to publish the above report.

## APHONIA FOLLOW QUININE ADMINISTRATION.

By N. S. KRISHNA IYER, B.A., L.M. & S.,

Calicut.

On the afternoon of 12th October, 1929, I attended on a case of fever of 2 days' duration. The patient was a young girl, aged about 16 years; when I saw her, her temperature was 103.8, pulse 126 per minute, respirations slightly accelerated, tongue coated, and bowels a little loose. The history given by the patient seemed to suggest a diagnosis of malarial fever.

I thought of trying a few doses of quinine mixture on her and accordingly 4-grain doses of quinine sulphate were prescribed. The first dose of the mixture was administered at 2 p.m. At about 6 p.m., the patient began to lose her power of speech; the condition gradually got worse and worse until by 10 p.m., she could articulate no words at all. The patient's relatives naturally grew anxious about her and I had to go and see her again.

The patient's condition was much the same as it was in the afternoon except that aphonia was present. She was entirely conscious, could open her mouth, protrude her tongue out well and could understand everything that I said to her, but she herself could make no sort of a reply. After great pressure on my part she just muttered correctly the number of the fingers which I was exhibiting before her.

I told the relatives not to be anxious about her condition which would soon pass off, and not to give her any mixture for the night.

The condition improved during the night, and she was all right next morning, when, without consulting me, another dose of the mixture was given. This time also, after just the same interval as before, 4 hours, the aphonia supervened and lasted till the evening of that day.

The mixture was necessarily withdrawn, the patient was put on diaphoretics and, made an uneventful recovery.

Though disturbances of vision and hearing are occasionally met with, yet aphonia is seldom been reported and the rarity of the condition justifies the above description of my recently encountered case.

## A CASE OF FRACTURE-DISLOCATION OF THE CARPAL SCAPHOID (NAVICULAR).

By MILITARY ASSISTANT SURGEON C. D. TORPY,  
M.M.F. (B.), I.M.D.,

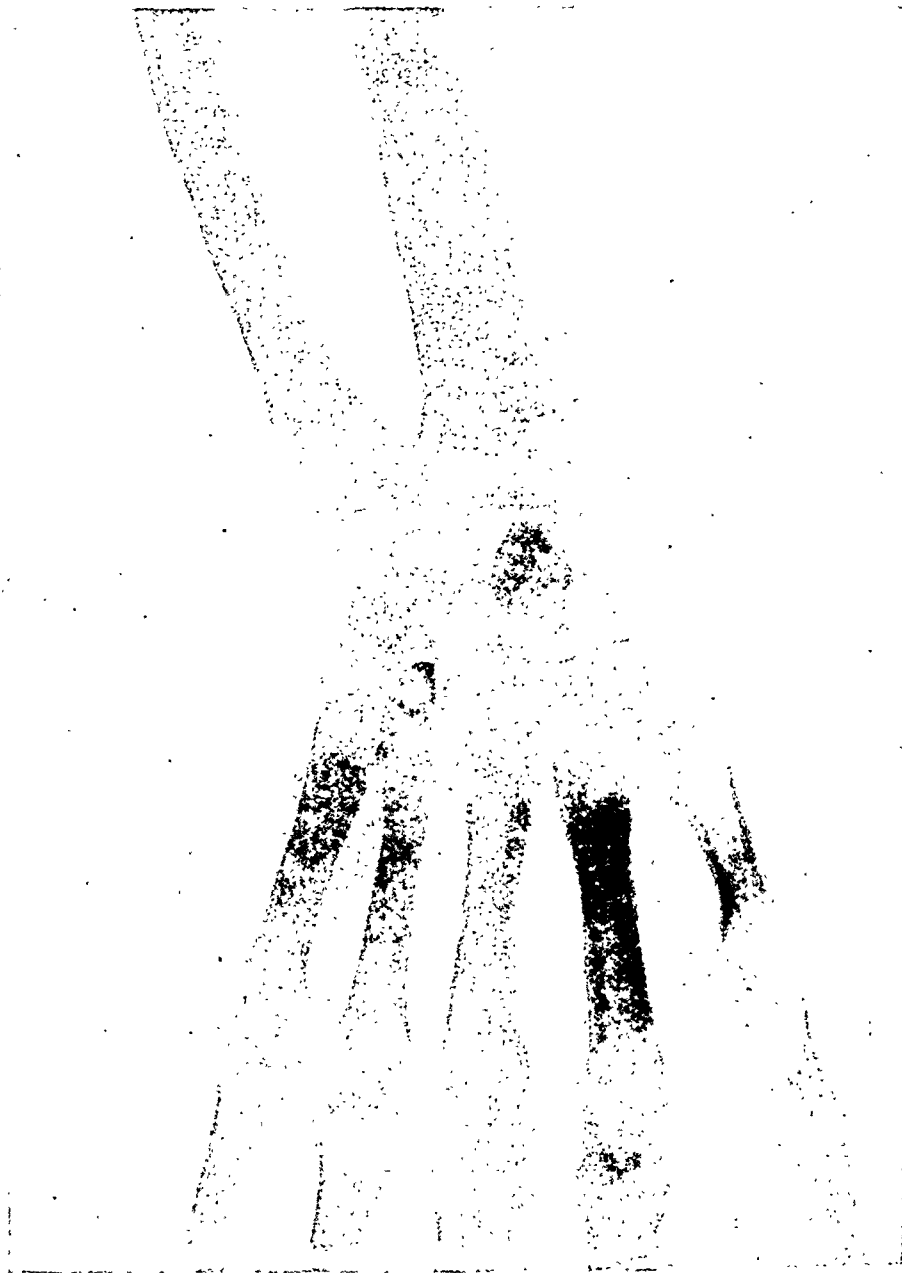
*In-charge, Radiological Department, British Military  
Hospital, Trimulgherry.*

TROOPER A. was thrown off his horse at the riding school; he sustained what was thought to be a simple sprain of the right wrist. He was treated by palliative measures for this condition for over a month without any

and with a fuller range of movements of the wrist, the disuse atrophic appearances soon disappeared.

The important points in this case are:—

1. Without a radiological examination, a correct diagnosis could not have been arrived at, which emphasises the importance of having all severe "sprains" radiographed.
2. The tripartite nature of the fracture.
3. The amount of "disuse atrophy" that soon followed the lesion.



improvement. He was then sent for radiological findings as a " ? T.B. wrist."

The skiagram revealed an unusual tripartite fracture-dislocation of the carpal scaphoid (navicular). There was a total loss of architectural appearance of the metacarpals, and of the lower ends of the radius and ulna, a condition characteristically typical of a "disuse atrophy."

Fractures of the scaphoid are usually of the "snapped waist" type with little or no displacement, but in this case the tripartite nature of the fracture with the displacement of the fragments offered some difficulty in arriving at a diagnosis.

With the aid of stereoscopic pictures, two of the three fragments were removed by surgical operation later;

## SPECIAL ARTICLES.

### ARS OBSTETRICA.

By V. B. GREEN ARMYTAGE, M.D., F.R.C.P. (Lond.),  
LIEUTENANT-COLONEL, I.M.S.,

*Professor of Obstetrics, Calcutta Medical College, and  
Surgeon to the Eden Hospital.*

*Renal Disorders and the Toxæmia of Pregnancy.*

DURING recent years many papers have appeared on this subject, notably those by Caldwell, Lyle, Harris, F. J. Brown, James

Young and Gibbard. As a result of the study of many hundreds of cases we now can assume that there are four definite clinical types:—

1. The nephritic type. Patients with chronic nephritis preceding pregnancy. These patients continue with signs of renal deficiency after pregnancy.

2. Patients presumably healthy before pregnancy, who develop albuminuria during pregnancy, but in whom all signs and symptoms of renal disease disappear after delivery, and do not recur with subsequent pregnancy. These form 40 per cent.

3. Patients presumably healthy before pregnancy, who develop albuminuria during pregnancy and in whom all signs and symptoms of renal disease disappear after delivery, but recur regularly with subsequent pregnancies. These form 50 per cent.

4. Patients presumably healthy before pregnancy who develop albuminuria during pregnancy, but in whom all signs and symptoms of renal disease persist permanently after delivery. These form 10 per cent.

It may be stated therefore that recurrent albuminuria may be looked upon as due partly to a subliminal pregnancy toxæmia, and partly to a pre-existing occult nephritis, caused by the first toxæmic pregnancy. *Hence we may state that pregnancy itself is the most delicate test of renal function that we possess.*

F. J. Brown has conclusively proved by experiments that antepartum hæmorrhage is not due to organisms, but is due to either chronic nephritis interfering with the normal metabolic function of the kidney, or to failure of the kidney to excrete poisons which eventually lead to hæmorrhage when they have accumulated in the circulation in sufficient concentration.

#### Treatment.

The above observation of clinicians have led to the following didactic principles of treatment:—

1. Seeing that toxæmia is most lethal to the *fœtus in utero*, we have no justification for gambling with the life or health of the mother in the interests of a child whose survival is problematical. Holland, in a series of 351 *fœtal* deaths, demonstrated that 77, that is 26 per cent., were caused by albuminuria, eclampsia, or accidental hæmorrhage, and that the mother's future health was jeopardized in 50 per cent.

If the manifestations are slight and the patient is under adequate supervision, one may safely temporize whilst viability of the *fœtus* is possible, but if there is marked œdema, a blood-pressure 30 or 40 mm. higher than it should be, a heavy deposit of albumen in the urine, and more especially if there are headaches and visual symptoms, to delay is dangerous.

2. In all toxæmic patients who are seen before the seventh month, delay is rarely justified in the interests of mother or infant, and especially is this so if the woman has suffered renal damage in a previous pregnancy.

3. For ordinary routine purposes where urgency is not immediate, the best means for the induction of premature labour is the bougie or stomach tube method, followed up if need be by the castor-oil-quinine-pituitary technique.

4. For cases of grave urgency the above methods are too slow and uncertain. The best plan is to perform Cæsarean section under spinal anaesthesia, with ligation of the tubes if there has been toxæmia in a previous pregnancy, for no woman should be exposed to further risk of conception if she has had two or more toxic pregnancies.

5. As regards the dietetic treatment of the albuminuric pregnancy patient in the acute stages, the best results have followed the Van Noorden plan of giving nothing but fruit juice, sugar and water with just sufficient alkalis to render the urine alkaline until there are no red blood cells present.

For the treatment of the œdema when the urine is free of blood, the following diet scheme of Langdon Brown is recommended.

#### 1. Low Nitrogen Diet.

*Breakfast.*—Milk 4 oz., porridge 8 oz., bread 2 oz., butter  $\frac{1}{2}$  oz. Fluids: Coffee 10 oz., milk 2½ oz.

*Lunch.*—Bread 3 oz., butter  $\frac{1}{2}$  oz., lettuce or tomato 1½ oz. Fluids: Milk 5 oz., barley water 10 oz.

*Dinner.*—Potato 4 oz., greens 5 oz., butter  $\frac{1}{2}$  oz., stewed fruit 4 oz., boiled rice 4 oz. Fluids: Lemonade, imperial drink, or barley water 12 oz.

*Tea.*—Bread 3 oz., butter  $\frac{1}{2}$  oz., lettuce or tomato 1½ oz. Fluids: Weak tea 10 oz., milk 2½ oz.

*Supper.*—Potato 4 oz., butter  $\frac{1}{2}$  oz., greens 5 oz., stewed fruit 4 oz. Fluids: Lemonade or barley water 12 oz.

This diet contains: Protein 49 grams; carbohydrate 358 grams; fat 35 grams. Caloric value, 1,992.

#### 2. Moderate Nitrogen Diet.

*Breakfast.*—Egg 1 oz., bread 2 oz., butter  $\frac{1}{2}$  oz. Fluids as in No. 1 diet.

*Lunch.*—Bread 4 oz., butter  $\frac{1}{2}$  oz., tomato or lettuce 1 oz. Fluids as in No. 1 diet.

*Dinner.*—Mutton or fish 3 oz., bread (alternate days) 2 oz., butter  $\frac{1}{2}$  oz., stewed fruit 4 oz. Fluids as in No. 1 diet.

*Tea.*—Bread 4 oz., butter  $\frac{1}{2}$  oz., tomato or lettuce 1 oz. Fluids as in No. 1 diet.

*Supper.*—Greens 2 oz., potato 3 oz., bread 4 oz., butter  $\frac{1}{2}$  oz., stewed fruit 4 oz. Fluid: Milk 5 oz.

This diet contains (on average): Protein 64 grams; carbohydrate 407 grams; fat 91 grams. Caloric value, 2,772.

These diets proved suitable in the experience of other observers also. Alcohol is certainly undesirable in azotæmic nephritis.

The efficiency of the kidney is periodically tested by the urea concentration test. Dr. Brown suggests, if need be, 1 to 2 drs. of ammonium chloride should be given on each of two days, and then on the third day a half to 1 c.c. of novasurol are injected intramuscularly. This treatment for the œdema can be repeated after a few days.

#### The Management of Pregnancy Complicated by Heart Disease.

Whether or not to allow a woman with heart disease to go through pregnancy, that is the question, for we have to decide whether or not the heart will be able to supply blood for the physical demands of the later

months of pregnancy, and especially for the strenuous effort of the hours of labour.

In the past the diagnosis of the anatomical lesion has been used as a basis for prognosis, but this is not an entirely reliable basis, for Sir James Mackenzie pointed the way to a better understanding of the problem by focusing attention upon the signs and symptoms of failure of the heart to maintain a normal circulation; hence we may lay down the maxim that *the prognosis of pregnancy depends upon the functional cardiac diagnosis, that is the patient's ability to perform physical exertion.*

The New York Heart Association has done a good service to all obstetricians by dividing all organic cardiac pregnancy cases into four classes according to their cardiac functional capacity:—

*Class 1.*—Those who are able to perform ordinary and usual physical activity without unusual fatigue, palpitation or dyspnoea.

*Class 2.*—Those who are able to perform their usual normal activity but who have discomfort in so doing, e.g., shortness of breath after climbing stairs or housework.

*Class 3.*—Those who are unable to perform the more difficult features of ordinary physical activity, e.g., climbing two flights of stairs, or walking half a mile without stopping on account of fatigue or palpitation.

*Class 4.*—Those who are unable to perform the simplest physical activity, e.g., inability to walk 100 yards, or climb a stair, or do any housework without dyspnoea or palpitation.

In hospital or consulting room, a test exercise such as asking the patient to swing a 5 to 10 lb. dumb-bell from between the legs to straight overhead 20 to 25 times is of considerable help, for the physician can note the pulse rate and general reaction and especially the occurrence of dyspnoea as the exercises proceed, and can then classify her accordingly.

Pardec reports 112 patients with heart disease tested by these means in the antepartum clinic of the New York Lying-In Hospital: 75 were diagnosed as Class 1; 20 as Class 2; 11 as Class 3; and 6 as Class 4.

Of the 75 patients in Class 1; 60 entered hospital for delivery and there was no cardiac embarrassment during or after labour.

Of 20 patients diagnosed as Class 2; 12 entered hospital, 5 went through perfectly uneventful labours, 6, however, with varying fortunes as to the duration of labour had for a short period increase of pulse and respiration rates with slight dyspnoea, but all recovered. One died of pulmonary embolism.

Of 11 patients in Class 3; 9 entered hospital, 3 were delivered uneventfully, 2 had considerable cardiac embarrassment, 2 had Cæsarean section and recovered, but 2 others died after operation.

The great difficulty in predicting the effect of labour is the inability to foresee the duration and severity of the strain in each case. With a short first stage and a short second stage, perhaps assisted by low forceps, there may be little strain

imposed upon the heart, but a long second stage is disastrous to a weak heart muscle.

If a woman is in Class 4 when seen, and her heart fails to respond to expert treatment after two or three weeks, the pregnancy should be terminated by that method which combines the utmost speed with a minimum of cardiac strain, either under chloroform, ether, or local anaesthesia. Spinal anaesthesia should be never used in these cases.

### *Puerperal Pyæmia.*

An interesting discussion has recently occurred on the question as to whether surgical intervention is justifiable in puerperal pyæmia. Polak points out that after expulsion of the placenta there is normally obliteration of the uterine vessels, but if such thrombi become inoculated with pathogenic bacteria the thrombus becomes liquefied and the intima eroded with the escape of pus cells or infected emboli into the circulation.

Should the cellular defence of the individual be small, and the virulence of the infection great, the organisms are practically in pure culture, and inevitably the patient will die whatever treatment is adopted. On the other hand, if the cellular reaction of the blood is sufficient, or the organisms are of low virulence Nature will provide additional defensive thrombo-phlebitis, and it is found in practice that these patients recover in 60 per cent. of cases without operation. Our experience in the Eden Hospital of these cases is a very large one and corroborates this view, but the great difficulty which befalls every clinician is to make an accurate diagnosis of the pathological problem early enough to warrant surgical interference.

The clinical picture to my mind is not sufficiently distinct in the majority of cases to warrant a hazardous laparotomy with a mortality of 50 per cent. even when done at the earliest opportunity, for conservative treatment on the lines of auto-vaccine therapy, small repeated direct blood transfusions, and quinine injections give at least a 60 per cent. recovery, provided all pelvic manipulation is avoided.

A diagnosis of puerperal pyæmia may be assumed in the presence of the following:—arrested involution, profuse red lochia, after pains, and the passage of clots. Repeated rigors indicate bacterial escape beyond the confines of the thrombus. The rise of temperature to 104 or 106 which follows such escape, and is succeeded by a sudden remission to normal with profuse sweating, shows that the veins are temporarily blocked by new clot formation. Such a clot in a few hours again becomes liquefied and the clinical syndrome is repeated. The pulse rises with the temperature but does not show a proportionate fall. The hæmoglobin percentage rapidly diminishes and there is progressive anaemia due to destruction of the red blood cells. As a rule there is leucopenia and a low blood platelet count.

### *The Bacteriology of the Puerperium.*

The normal uterus is bacteriologically sterile immediately after delivery, but gradually becomes infected from then onwards, so that 25 per cent. of all cervical cultures are positive on the first day, 50 per cent. on the second day, and 100 per cent. on the third day of the puerperium. Moreover, it has been proved that infection of the fundus uteri concomitantly occurs, reaching its maximum on the fifth day and then diminishing.

Armstrong and Burt White have shown (1) that *S. pyogenes* is found frequently in the cervix without any symptoms of disease, but in such cases it is always in association with other organisms.

(2) If *S. pyogenes* is found in cases of puerperal sepsis, the severity of the illness is in proportion to the number of streptococci present, and that the body of the uterus is rapidly invaded from contiguous surfaces early in the puerperium.

(3) The severity of puerperal sepsis is proportionate to the trauma of childbirth, whether natural or artificial.

(4) Mellanby has found by experiment that much of the decreased resistance of an individual to bacterial invasion is due to deficiency of vitamine A in the mother's body, for the foetus *in utero* throughout pregnancy makes great demands upon the maternal store and supply of vitamine A, and most particularly of that store in her liver. On this hypothesis Professor Mellanby, in co-operation with the authorities of the isolation block of the women's hospital of Sheffield, treated a number of cases with two preparations (X and Y) of vitamine A which were respectively 10 and 150 times more rich in vitamine A than cod-liver oil.

Substance X was given in 2 dr. doses twice a day, substance Y was given in 2 drop doses 12 times a day in orange juice.

Substance X is radiostoleum supplied by the B. D. H. Substance Y was supplied by Lever Bros.

Five cases of hæmolytic streptococcal septicaemia were treated, they all recovered.

Mellanby is of opinion that the effect of vitamine A is rather to increase gradually the general resistance, than to act suddenly as might be expected in the case of a substance having a specific bacteriocidal or anti-toxic action. He found that blood cultures from these patients became sterile within a fortnight of the administration of vitamine A.

These five cases are of course too few in number to permit the deduction that this form of treatment is specific for septicaemia, but it does warrant the belief that vitamine A plays an important part and has the property of raising the resistance of the body to bacterial infection.

This research work will I am sure be appreciated in India, for the anti-infective action of vitamine A will probably be shown to be equally potent in all cases of bacterial invasion: we should particularly welcome this work from the prophylactic point of view in obstetrics for it proves the

importance of such foods as fresh eggs, green vegetables, milk, butter and cheese, all of which contain vitamine A for the expectant mother, and should there be suspicion of difficult labour, then how easy is it to order radiostoleum for one month before confinement.

### *Inversion of the Uterus.*

The question of immediate treatment of the inverted uterus has always been a moot one, some authorities advising restitution, others advocating that the organ should be left in its undignified position, although all are agreed that nothing should be done whilst the patient is suffering from shock.

My reason for mentioning this subject is that it is not generally recognized that spontaneous reduction of an inversion frequently occurs, and that if there has been much trauma, oftentimes the patient dies of sepsis if the uterus is manually replaced.

Boxall, Comyns Berkeley, Miller, McCullagh, and Phillips have all recorded cases of spontaneous restitution, therefore it may be stated that if obvious signs of sepsis are present, the inverted uterus should be left untouched save for the removal of placental remains, and saline lavage given daily until all discharge ceases and the uterus becomes firm. Then if manual or instrumental replacement fails operation is permissible.

In India most of the cases of inversion of the uterus are horribly septic when first seen, days after delivery, therefore practitioners should bear in mind that sepsis inside a soft involuting uterus, lacerated and contused by reduction, predisposes to septicaemia, parametritis or phlegmasia alba dolens with death or a protracted convalescence.

### *Postnatal Maternal Care.*

(1) It has been said that 60 per cent. of gynæcology is made up of lesions secondary to childbirth. It is therefore an obvious corollary that the degree of skill and care with which the process of delivery is conducted is an important factor for a woman's subsequent well-being.

Ante-natal care has come to stay, but after the crisis of labour there is apt to occur an anti-climax in which the care and watchfulness of the physician tends to relax, with the result that the patient passes out of his vision without a single postnatal examination. This is wrong, for there are a host of disabilities which may beset the young mother. It is my experience that the body, muscles and tissues take at least 10 weeks to resume their normal, after the lying in period and it is for that reason that massage, postural and abdominal exercises are so important, for visceroptosis is extraordinarily common in India. Indeed many women are the better for the wearing of a Curtis or similar belt for many months after labour. In addition in the tropics the gaping, relaxed vaginal outlet is a constant source of exasperation to both husband and wife; this condition is due to stretching and non-involution of the sphincteric muscle fibres together with the



levator ani. It can be rectified by the Stacey Wilson exercises which I have detailed in a previous publication.

(2) In at least 30 per cent. cases retroversion of the uterus occurs, which is responsible for back ache and blood discharges. Routine examination of every patient about the sixth week after labour would obviate such symptoms, for the temporary application of a pessary will cure the majority of such patients.

(3) Laceration of the cervix followed by infection and erosion is present in at least 20 per cent. of cases after the first baby. Such laceration is a frequent cause of troublesome symptoms and occasionally of one child sterility.

Immediate treatment, two or three weeks after labour with a 10 per cent. solution of silver nitrate, or the use of the electric cautery which can be done without an anæsthetic will cure the majority of these cases; others, however, will need operative measures.

(4) Sub-involution due to sub-acute infection or subsequent to difficult labour is responsible for much ill health, apart from the fact that the uterus usually drops downwards and backwards giving rise to back ache, discharge and possibly dysuria. Replacement and support of the uterus are beneficial but occasionally Hobbs' glycerine treatment will be found most beneficial.

(5) It is necessary to mention sacro-iliac pain for it is by no means uncommon in the tropics for women to complain of pain in sitting or rising after their first labour, due to stretching of the joint ligament, and often you will find that so-called coccygodynia is referred pain from the sacro-iliac joints. Such cases can be treated by massage or the use of special belts which strap across the hips.

Occasionally an under-lying prolapse or constipation with visceroptosis are responsible for symptoms referred to the lumbosacral regions.

(6) Infection of the cellular tissue of the pelvis often exists, the result of a prolonged or difficult labour. This condition is as a rule missed by the practitioner who is not an expert in vaginal examinations, for the cellular infiltration usually involves the uterosacral ligaments or possibly the parametrium on one side, without involvement of the tubes and ovaries.

Such a case can be diagnosed accurately by putting the tissues on the stretch when making a vaginal examination: if for example the cervix be pushed by the finger towards the right you elicit a left iliac pain, or by pushing it forwards you produce a sacral pain, you can diagnose that the old inflammation is in the parametrium or uterosacral ligaments as the case may be.

Frequently in such a case you will find the cervix is permanently dislocated by the cicatricial contraction following cellulitis.

(7) One child sterility is a frequent cause of anxiety. Apart from gross lesions following childbirth, it frequently is caused by a low grade form

of sepsis which has travelled upwards from the cervix eventually involving the tubes.

Short of an abdominal operation, only a Reuben or Lipiodol test can discover this, for it is the rule rather than the exception in the class of case that I am discussing to find nothing whatever palpable vaginally.

Lastly, quite apart from mental disorders, occasionally we meet with cases of endocrinal dysfunction after pregnancy, where the patient has complete amenorrhœa, puts on weight, becomes apathetic and her skin is dry. These are cases of pituitary and thyroid hypofunction, and in them you will expect and find one child sterility.

It has been suggested that the cause of this dysfunction is a poison absorbed from some local focus which injures the endocrine system. The teeth, the tonsils or the cervix are probably the criminals.

### *Cæsarean Section.*

Ivens has recently recorded a consecutive series of 295 Cæsarean section with a mortality of 1.3 per cent. This remarkable result included clean, potentially septic, and frankly septic cases. She drains the abdominal cavity for 48 hours in septic cases, and gives them at the time of operation 30 c.c. of anti-streptococcic serum. This record of success still further encourages us to preach against the indefensible attitude of those in India who prefer to do a craniotomy on a living child rather than infinitesimally risk the life of the mother by Cæsarean section, for the maternal mortality of craniotomy in India is greater than that of Cæsarean section, whether the case be septic or not.

### *White Asphyxia.*

In 1926 I cited the work of Dame Louise MacIlory on this subject; since then we in the Eden Hospital and many other workers have corroborated her findings and insisted that the proper treatment of these infants is that of shock, for in the majority of cases they have just suffered severe mechanical cerebral stress, and anything in the shape of strenuous artificial respiration is only piling Pelion upon Ossa, or making bad conditions worse.

Time and again we have noted in our hospital, when women have been brought in late, for delivery by forceps or Cæsarean section, that if the toneless asphyxia pallida baby has had the mucus extracted from its throat, and has had 5 minims of adrenalin injected into the heart and is kept in a hot bath for an hour or more, that it begins to breathe as the shock of delivery passes off. While in the bath it is our routine to pass a middle finger into the rectum, or dilate with forceps the foreskin. Sometimes half a c.c. of pituitrin or one-sixtieth of a grain of strychnine are given into a muscle. On these lines practitioners will save a great number of these infants, which in previous days would have been treated by such abominable and disappointing methods as those of Shulze's artificial respiration which frequently causes intraspinal hæmorrhage.

In those cases that do not survive, or such as have had vigorous Sylvester artificial respiration, it is by no means uncommon to find that the cause of death is either subdural hæmorrhage from rupture of the tentorium cerebelli, or damage to the suprarenal capsules.

Dame Louise MacIlroy has recently demonstrated that good results may follow in many cases from the administration of carbon dioxide gas; this is extremely interesting for the principle is the very reverse of artificial respiration.

#### *Placenta Prævia.*

The pendulum gradually is swinging away from the old time treatments. When I was a student version was looked upon as the best method, but to-day team work and follow-up clinics, together with systematic consideration of the various methods of treatment, point to the fact that version, and for that matter, plugging, are means which are hardly justifiable except in an emergency by the general practitioner far from hospital aid.

Immediate hospitalization is the first essential, directly diagnosis is clear. In the majority of cases of lateral and marginal placenta, simple rupture of the membranes with the application of Willett's vulsellum to the foetal scalp, gives the smallest foetal and maternal mortality, for the great principle of treatment is to compress the bleeding point and what better compressor do we possess than a hard foetal head. It is our custom to attach a one pound weight to the handle of the Willett forceps; the bleeding stops, the cervix dilates and the risk of tearing the cervix is far less than in the case of version, which every one knows is by no means an easy operation for the general practitioner. Willett's vulsellum is cheap and very easily applied through a cervix which admits two or even one finger. It is my opinion that this method should be more generally known and used in this country.

Cases do occur, however, which indicate a more general use of Cæsarean section. I refer to patients with central placenta prævia who are primiparæ or in whom the os is hard and not dilated more than one finger, or in whom the pelvis is contracted or the foetus near full term. The mortality in these cases treated by other means is appalling, the mother dying in over 40 per cent. of hæmorrhage or sepsis, whereas the infant is born dead in over 80 per cent.

When discussing this problem last year in Berlin, Vienna, Munich and Zurich, I was not surprised to find that the consensus of opinion was all in favour of Cæsarean section, several professors informing me that their maternal mortality had been reduced to less than 10 per cent. and their infantile mortality to under 20 per cent. since they adopted Cæsarean section as a routine method.

This being so, it behoves us to relax our somewhat rigid and conservative attitude as regards treatment for those cases where the foetus is alive, and the general condition of the patient indicates

that better results as regards both mother and child will be obtained by Cæsarean section.

Finally, in this connection may I appeal for two things which are long in becoming popular in India, namely, immediate hospitalization and the wonderfully beneficial effects of direct blood transfusion, for the excellent results obtained in Great Britain, America and the Continent depend to a very large extent on these two factors.

#### THE EVOLUTION OF MEDICAL PROTOZOOLOGY.

[Being the presidential address to the Medical and Veterinary Research Section of the Indian Science Congress held at Allahabad in January 1930.]

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(Illustrated by lantern slides.)

LADIES AND GENTLEMEN,

My first duty is to thank you and the Council of the Congress for the very great honour which you have done me by asking me to preside at the present meeting of the Section; an honour which I most deeply appreciate, not so much on personal grounds, as on behalf of the Calcutta School of Tropical Medicine and Hygiene. The Indian Science Congress is the one opportunity which scientific workers in India have annually of getting together and comparing notes; as such it is essentially the most important stimulus to scientific research work in this country.

I have been much exercised in mind as to what subject to choose for this address. For the past nine years my work has centred entirely on problems in medical protozoology, and what has impressed me more and more in the study of this subject is the large and important part which workers in India have played in the development of this new science. I have therefore chosen the evolution of medical protozoology—or, better, of medical protistology—as the subject of my address; for there are many lessons from the past for the worker of the present and the future.

The history of protozoology is almost the history of the evolution of the microscope, since the vast majority of protozoa are so minute that they cannot be studied without a microscope. The father and founder of the science, Antony van Leeuwenhoek (1632–1723), was one of the most marvellous men who ever lived. "This old Hollander," writes Dobell (1922a) "was, in truth, one of the most original men who ever lived. It is impossible to compare him with anybody else, for he belongs to a genus of which he is the type and only species. Your typical scientific genius gets a good education; Leeuwenhoek got practically none. He goes to a university and studies under distinguished professors; not so Leeuwenhoek. He imbibes the traditional knowledge of centuries and then begins to re-arrange and develop it for himself; but all that Leeuwenhoek knows he has learnt himself from Nature, and when he sets to work he relies entirely on upon his own native genius. He cannot even read what others have written on the subjects that interest him. He can only talk to Nature, ask her questions in 17th century Dutch, and puzzle out her answers by himself."

Leeuwenhoek was born in 1632 at Delft and came of good Dutch stock. He was probably fairly well-to-do, and married at the age of 22. During most of his long life he held the post of Chamberlain to the Sheriffs of Delft, an office which was probably a sinecure, and devoted his entire time to microscopic studies. He began at the very beginning by learning how to grind and mount lenses. With infinite patience and infinite perseverance he devised every piece of apparatus which he used, repeating his experiments again and again in order



to convince himself of their accuracy. He ground all the lenses which he used, and even extracted the silver from its ore in which to mount them. In all he is known to have made and mounted some 400 lenses, some of them having a magnification of 300 or more diameters. With these lenses, Leeuwenhoek commenced to examine every fluid that he could think of, commencing with his own bodily secretions and excretions. For forty years he laboured in complete obscurity, working carefully, incessantly, patiently, and laboriously.

The Royal Society of London had its first origins about 1645, and was officially founded in 1660. Its Secretary wrote to different scientists all over Europe, asking for scientific contributions. One of these letters found its way into the hands of Dr. Reiner de Graaf (whose name is associated with the Graafian follicle), and who was a friend of van Leeuwenhoek. He communicated its contents to Leeuwenhoek. Thereafter Leeuwenhoek periodically wrote letters to the Royal Society describing his observations. It is in this series of some 200 letters extending over the last fifty years of his life, that Leeuwenhoek described his discoveries. During a large part of that period Great Britain was at war with Holland, but still the letters were smuggled through. He was made a Fellow of the Society in 1680, when 47 years of age, and this appears to have stimulated him to further efforts. This wonderful series of letters, written in 17th century Dutch, in a clear scholarly hand, fully illustrated with pen and pencil sketches and drawings, is still extant, being preserved in four large folios in the library of the Royal Society. The letters are to-day as fresh as if they had been written yesterday. In one of the folios attached to a page of the manuscript is a tiny envelope made of tissue paper containing some of his free-hand botanical sections of a plant, sections now 250 years old, but perfectly fresh and still suitable for mounting to-day.

The immensity of the Leeuwenhoek's observations is almost incredible. He studied the capillary circulation, and the blood corpuscles of different species of animals; also the histology of all manner of plants and animals. He was the first person to see spermatozoa, to see bacteria, to see spirochaetes, to see protozoa. He investigated the life history of the louse, the flea, and the ant, and discovered parthenogenesis in the Aphids. He discovered Hydra and its reproduction by budding; he discovered the viviparous reproduction of the vinegar eel; he discovered the Rotifers and their power of surviving desiccation. Animal and vegetable embryology, crystallography, the microscopic study of chemical compounds, were all subjects of his investigations. The letters are not of the character of scientific memoirs, but are familiar conversations, conveying a vivid and delightful impression of the charm and personality of the writer; long, rambling, couched in the colloquial style of his age and country. Yet they created both bacteriology and protozoology, where before there had been neither science. Everywhere he draws a clear differentiation between what he has seen, and what he infers; "I have observed" he writes of the former; "I figure to myself" he writes with regard to the latter.

It appears to have been in 1674, according to Dobell, that Leeuwenhoek first saw protozoa. The next year he was observing and studying protozoa in rain water, canal water, infusions of pepper, ginger, and nutmegs, and elsewhere. Naturally the first protozoa which he discovered were free living ciliate or flagellate protozoa, and his descriptions of *Vorticella*, *Stylonychia*, *Bodo*, are stated by Dobell to be so accurate that anyone familiar with these organisms would recognize them from his descriptions. In 1674 he was the first person to see a parasitic protozoon—oocysts of *Eimeria stiedae*, the coccidium of the rabbit; though he did not know what they were. In 1681 he discovered *Giardia intestinalis* in his own stools, and gave a detailed account of this parasite. In 1683 he discovered *Opalina* of the frog, and also probably *Nyctotherus* of the frog. In 1680 he discovered anaerobic bacteria in pepper infusion, and in the same year yeasts in beer. In 1681 he discovered the bacteria of the human mouth and intestine—

including the spirochaetes. He saw and correctly interpreted the cilia and cirri of ciliate protozoa, and the flagella of flagellate protozoa; and even observed and correctly interpreted conjugation amongst the Ciliata.

Leeuwenhoek did not realize the full importance of his discoveries—nor did anyone else in his day. He was content to observe constantly, discover, and describe; contradiction, censure and even ridicule did not affect him; "It doesn't bother me," he writes, "I know I'm in the right."

And so we may leave this wonderful old Hollander, who for fifty years instructed the scientific world of Europe. He died in 1723 when nearly 91 years of age, still working and observing to the end of a long and ever memorable life.

A little later than van Leeuwenhoek was Louis Joblot (1645—1723), Professor of Mathematics, Geometry, and Perspective at the Royal Academy of Painting and Sculpture in Paris. During his tenure of office his chief attention was turned to the study of optics and microscopy. With the assistance of a scientific instrument maker in Paris he constructed microscopes of various patterns and then used them in the investigation of microscopic animals. His book on microscopes was published in 1718, and the second half of it, illustrated with 12 plates, is devoted to his study "of an innumerable multitude of insects and other animals of divers species." Many of Joblot's "insects" or "fishes" were protozoa, and Dobell (1922a) considers that this second portion of the volume "is, in fact, the first separate treatise ever written on the 'Infusoria.' It contains the first account, and the earliest published figures of many different protozoa—some of them easily recognizable, but a number not identifiable with any certainty." Joblot used no names for the ciliates which he was studying, but used such terms as 'bagpipes,' 'funnels,' 'kidneys,' 'gluttons,' 'pirouette dancers'—'the slipper' for *Paramacium*, and 'the swan' for *Amphileptus*. His work is chiefly remarkable for the experiments which he conducted to disprove the possibility of spontaneous generation, a matter in which he was precursor of both Spallanzani and Pasteur.

From 1723 to 1786 the field of protozoology lay almost fallow. Many zoologists regarded with doubt and misgiving everything seen with the microscope, though in those days continuous progress was being made in the perfection of that instrument. The great Linnaeus (1707—1778) appears to have always been suspicious of the Protozoa—*Chaos infusorium* is the name which he adopts for a whole series of questionable protozoal organisms. The embryonic science of protozoology was regarded rather as a suitable afternoon amusement for children than as a serious subject. Attention was naturally chiefly focused on the so-called 'Infusoria,' since these large free-living ciliate protozoa are so readily obtained in vegetable infusions, and are relatively large objects for study. Then in 1786 came Müller's book upon the Infusoria, published posthumously. "It is a remarkable work" writes Dobell; "full of shrewd observations, and showing astonishing insight, but containing of course many mistakes which were inevitable at that period. Many of the protozoa described and sketched by Müller—mostly from examinations made, as were those of Leeuwenhoek, with the aid only of a simple lens—are easily recognizable now by a protozoologist."

Up till about 1840, protozoology remained the perquisite of the micrographers, rather than a special branch of zoology. This period saw in 1838 the publication of Ehrenberg's great classic on the 'Infusoria.' It was a monumental folio volume of 550 pages, accompanied by an atlas of 64 coloured plates; and it summarized his researches, not only in Berlin, but also in Egypt, Arabia, Siberia and elsewhere. "It contained much that was new" writes Dobell, "and much that was true, everything of note that his industrious reading could find in the works of his predecessors, and withal a mass of mistakes, to which he clung tenaciously—in spite of violent contradiction and criticism—to the end of his days." This was followed in 1841 by Dujardin's great work; an octavo

volume of some 680 pages with 23 plates; and finally in 1880—1889 by Butschli's great monograph on the Protozoa. This work marks the end of protozoology as a hobby for microscopists, and the beginning of protozoology as a new science. "It is significant of the vast modern development of protozoology," writes Dobell, "that since then no work on a like scale by a single individual has been produced. It is now indeed impossible for any one man even to read all that has been written on the Protozoa, and the more recent workers have had perforce to devote their attention to some particular group of these organisms, or to some special branch of protozoology. To master a detail of the science is now the work of a lifetime. No one man can now claim to be an expert in all protozoology, any more than in all mathematics or all chemistry. The territory already surveyed was so vast that the most he could hope to do was to cultivate his own small holding properly."

From this point onwards we see protozoology studied from two main aspects; firstly as a pure science, an important branch of zoology; secondly, as an applied science, chiefly in medical and veterinary work. The importance of the former method is very great. Structurally and functionally a protozoan is the equivalent, not of a single cell of a metazoal animal, but of a whole metazoal animal itself. Dobell and O'Connor (1921) have well defined the Protozoa as non-cellular animals. Now hitherto biological study has been based almost exclusively upon the study of metazoal, i.e., cellular animals; and all the chief generalizations about such phenomena as birth, growth, development, sex, reproduction, heredity, variation and death have been based upon such study. To quote Dobell (1922a). "When the more important facts about the Protozoa are firmly established, we shall be able to recast many of our biological theorems in a more satisfactory form. The Protozoa offer us, in other words, a new world of animals for generalization, and a new standpoint from which to survey our old-world zoological knowledge. The discovery of the Protozoa was to zoology what the discovery of America was to geography. But we are still, in protozoology, in the 16th century..... As yet we are hardly on the threshold of the new biology, but for those who delight in the destruction of error and the advancement of true learning, the protozoological prospect is already full of hope."

It is with applied protozoology, however, rather than with pure protozoology that the medical man and the veterinary surgeon are concerned, and it is the evolution of this branch of the science that has now become of such fundamental importance in tropical and veterinary medicine.

The first piece of applied protozoology was Pasteur's ever famous study of pébrine. The story is of great historical interest, but I need hardly remind you of it. It is fully described in Mrs. Devonshire's translation of René Vallery-Radot's *Life of Pasteur*, and it is one which every scientific student and research worker should read. Pasteur was no protozoologist, but he laid broad and deep the foundations of modern bacteriology, and in doing so he also laid the foundations of medical protozoology. His scientific principles were impeccable, and equalled only by his own practical applications of them. In 1885 the sericultural industry of the world was faced with ruin; the silk fields of France were mortally stricken with pébrine, and even imported seed could not save them, for the infection had spread to Italy, Spain, Austria, Greece, and even China. Eggs, worms, chrysalids and moths were all infected; the peasant proprietors were in despair. J. B. Dumas appealed to Pasteur to do what he could. Although he replied that he had never handled a silkworm, Pasteur was so distressed by the sufferings of the peasants in the south of France that he immediately took up the problem.

How he solved it may be recalled in a few words. The spores of *Nosema bombycis*, the protozoal parasite that causes pébrine, are very highly refractile. And, although he did not recognize even that he was dealing with a protozoal infection, this gave Pasteur the clue to a prophylactic measure against the disease. You have a

room full of cocoons, he wrote. You want to know whether to smother the cocoons and spin off the silk, or to keep them for reproduction. Nothing easier. You hasten the development of about a hundred moths by elevating the temperature; these you crush in a little water and examine under the microscope for the refractile pébrine spores. If they are present, the moths are infected, their seed will be infected, and such seed must not be kept for next year's silkworms. Even if the cultivator be a peasant, he can always bottle a few of the moths in brandy and send them to a testing office or to some experienced person to examine.

It was this discovery that saved the silk industry of the world. The income to the State in the French industry, which had dropped from 130,000,000 francs a year to 8,000,000 francs, was restored; to-day pébrine still lingers to some extent in the silk fields of France, but whenever it threatens to become severe a rigorous application of the Pasteur method will always stamp it out. In India the pébrine problem is even more difficult than it is in France, since there are successive broods of silkworms in the year instead of only one; but the brilliant work of C. M. Hutchinson (1920) has shown how a more exact application of the Pasteur test may be utilized to stamp out the disease.

If the first great experiment in applied protozoology was carried out by an illustrious Frenchman, Pasteur, the second great pioneer in the same field was a Scotsman, happily to-day still with us, Sir David Bruce. By the end of the 19th century medical protozoology had become intimately linked up with another branch of zoology, viz., entomology; and to-day it is almost essential for every department of medical protozoology to have an entomological worker on its staff.

Bruce's preliminary work on nagana in Zululand was begun in 1894; but proved to be an abortive attempt. In September 1895 he resumed his study of the problem, and in May 1896 he wrote his final report on the disease at Umbobo, a report subsequently published in London in the next year. It is almost incredible that so great a discovery should have been made in so short a time. Trypanosomes had been known since 1842, if not 1841. Griffith Evans in 1880 had discovered the trypanosome which bears his name in animals infected with surra in the Punjab, and had shown that trypanosomes might be pathogenic. Theobald Smith and Kilborne in America in 1893 had shown that Texas fever of cattle, a disease due to a piroplasma, was transmitted from beast to beast by the agency of ticks. Neither of these two discoveries however is comparable to Bruce's classical work, which laid the foundation of the immense advances which were to follow.

The position when Bruce commenced his work was that there were fly belts in Zululand into which cattle could not be introduced without dying of nagana. The European settlers believed that the disease was caused by the bite of the tsetse, and Livingstone, the greatest of all African explorers, had been so impressed with the importance of the tsetse that he put a vignette of a tsetse on the title page of his *Missionary Travels*. The Zulus, however, believed that the disease was "caused by the presence of large game, the wild animals in some way contaminating the grass or drinking water." It was a stroke of genius on Bruce's part to fit these two hypotheses together and get at the truth. Within nine months he had discovered the trypanosome of nagana, which now bears his name, *Trypanosoma brucei*; had shown its presence in the blood of the wild game in the infected areas, and that it was harmless to the wild game, who are habituated to it, but pathogenic to oxen, horses, and other domestic stock introduced into the area of infection. He had discovered the transmission by Glossina, though he considered that such transmission was by direct transference on the proboscis of the fly, and had no suspicion of the cyclical development in the mid-gut and salivary glands of the insect. (It was only later, when Kleine in 1909 showed that fed flies did not become infective until the 18th to the 20th day after the feed on an infected animal, that suspicion of a cyclic development was aroused.)

Bruce's work was fundamental. "He threw a flood of light on many other protozoal diseases" writes Dobell, "and suggested all sorts of possibilities concerning their causation and prevention. He forged new links between zoology and medicine, and between entomology and protozoology..... Bruce's work was solid, complete, and demonstrative. By clean experiments and right reasoning he contributed more to science in a few months than hundreds who have followed up his work have since been able to contribute in many years. In work of this sort it is the quality, and not the quantity, that counts. Later researches have but served to enhance the magnitude and the difficulty of the problem which confronted Bruce in 1895; and to find a just parallel to the masterly manner in which he solved it, we must go back to Pasteur. There is, indeed, the same simplicity, the same directness, the same insight, in the work of both these men. Their works are enduring demonstrations of the method of science; they are a delight to read, and illustrate on every page the favourite maxim of Boerhaave: *Simplex sigillum veri.*" (Simplicity is the hall-mark of truth.)

The immediate outcome of Bruce's work was, of course, the Royal Society's Commission on Sleeping-Sickness, 1903-1913. India will always be proud that two workers from this country, Lieut.-Col. E. D. W. Greig, I.M.S. (ret'd.), and Brevet-Col. F. P. Mackie, I.M.S., shared in the work of that Commission. The work of the Commission is so well known that here it needs no recapitulation. The Commission was under the directorship of Bruce himself, and its most important discovery was the cyclic development of trypanosomes in tsetse flies, and the relationship between *T. brucei* of wild animals, nagana of domestic animals, and sleeping-sickness of man. The position in Africa to-day is still serious enough in all conscience; but, had it not been for Bruce's great discovery, and the work of the Commission, immense tracts of the African continent might to-day have become uninhabited forests in which man could not live.

The rôle of biting insects in the transmission of protozoal diseases, thus established by the work of Smith and Kilborne and that of Bruce, was soon to be further established by the labours of the third of the great pioneers, Sir Ronald Ross, again a Scotsman. I need not here discuss his wonderful discovery of the transmission of bird malaria by *Culex* mosquitoes, and its applicability to the transmission of human malaria by *Anopheles* mosquitoes. This—the greatest discovery ever made in tropical medicine—was carried out in India, its final and triumphant issue being reached in Calcutta. There had been much brilliant work done on malaria before Ross' great discovery, whilst its final and complete confirmation by the Italian workers was an essential step on the road of progress. Laveran's great discovery of the malaria parasite (November 6th, 1880) had been confirmed by Richard (1882): the complete schizogony cycle and the relationship of the parasite forms to the temperature chart had been worked out by a host of workers, notably Golgi, Marchifava, Celli, Canalis, Grassi, Feletti, Bignami, Bastianelli, Sanfelice and Manneberg. But when Ross commenced work on the sporogony cycle in 1895, nothing existed except ingenious guesses as to the truth. Of these perhaps the most important was the paper by Richard Pfeiffer (1892), who recognized the relationship of the malaria parasites to the coccidia, and predicted for the former an exogenous cycle similar to that of the coccidia, but which, owing to the absence of a resistant stage comparable with the coccidial oöcyst, he thought would be found in the body of some blood sucking insect. The resulting germ, he thought, might find its way into man through the sting of the insect. It is doubtful, however, whether Ross had ever seen this paper, for he does not mention it in his *Memoirs*. Sir Patrick Manson's association with Ross' great discovery we need not dwell on here; nor the details of the great discovery itself. It is all a matter of history, and any medical research worker who has not read Sir Ronald Ross' wonderful *Memoirs* should consider his qualifications for his appointment inadequate.

What one would like to emphasize, however, were the conditions under which Ross worked in those days in India. To-day they are almost incredible. When Ross commenced work on the transmission of malaria nothing was known about the classification of mosquitoes; he could obtain no help, even from the Indian Museum, and it was only by degrees that he realized that he was dealing with three different types; the grey or barred-back (*Culex*), the brindled type (*Aedes*), and the dappled-winged (*Anopheles*). He had to pay the entire cost of his enquiry out of his own pocket. There were no Romanowsky stains in those days, and, to judge from his *Memoirs*, almost the whole of his work was carried out by fresh dissections and studying fresh unstained material. Soon after he had started his work, he discovered the process of ex-flagellation in the mosquito; but he had no sooner made this preliminary discovery than he was transferred on special sanitary duty to Bangalore. His views on this transfer, and the interruption of his work are set forth in the *Memoirs*; "Great is Sanitation—the greatest work, except discovery, that a man can do." And in his pocket-book he wrote the following stanza:—

'We cry "God, make us Kings,  
Poets or Prophets here"  
The scornful answer rings,  
"First be My Scavenger."'

In April 1897 after a five months' bombardment of Army Headquarters to put him on special duty for the malaria investigation, he took two months' leave, and in the rest house at Sigur Ghat discovered for the first time an *Anopheles* adult and realized that its resting attitude on the wall differed from that of the two types which he had been studying previously. It was on August the 20th, 1897, that he first found malarial oöcysts in fed *Anopheles* at Secunderabad. No sooner had he made this discovery than he was transferred on military duty first to Bombay, then to Kherwara in Rajputana, a place in which it was impossible to obtain material to continue his work. Ross heads the chapter in his *Memoirs* dealing with Kherwara "Punishment," though it is much more likely that his transfers were the result of military routine than of any intention of interfering with his work. Authority always finds it inconvenient to deal with genius; Sir Ronald could never stand either fools or authority patiently, whilst he sought, not to unravel, but to cut through red tape—an impossible procedure. It was during this interval in 1897 that MacCallum discovered the process of fertilization of *Hamaproteus columbae* of the pigeon, and that the true character of what was termed 'ex-flagellation' became clear.

Finally, however, in March 1898, Ross received at last the long awaited order, and was instructed to proceed to Calcutta for six months, during which period he was ordered to solve both the problem of malaria transmission and that of kala-azar transmission:—some order, when it is realized that the latter problem is still not finally cleared up after twenty-five years of intensive study of it by many workers in India. Even on his arrival in Calcutta, ill luck still dogged him, for cases of malaria were very difficult to secure, owing to a plague scare; and it was this that drove him to study *Plasmodium praecox* in *Culex* mosquitoes. It was in May 1898 that he sent in his ever memorable *Cultivation of Protozoa*, Labbé, in *Grey Mosquitoes* to Simla for publication. His views on the fact that it was not issued from the Government Press until October of the same year will be found in his *Memoirs*. In the meantime some thirty or forty copies had been made by hand and circulated.

If we add to all this the fact that Ross had not received any special protozoological or entomological training, as far as one can judge from his *Memoirs*, that he had to coin a new terminology for the parasite phases that he saw, one becomes even more than ever amazed at the brilliance of his work, his intuition, and his great discovery. In logical sequence Pasteur, Sir David Bruce, and Sir Ronald Ross are the great triumvirate who created medical protozoology.

Ross had predicted on the most solid grounds that the development of the human malarial parasites in *Anopheles*

mosquitoes would be found to be similar to that of *P. praecox* in *Culex* mosquitoes; but it was the Italian workers who finally demonstrated the actual transmission of human malaria from man to man by *Anopheles* mosquitoes. From that day to this the actual parts played respectively by Ross and by Grassi in the great discovery have been the subject of an endless and most acrimonious controversy. To the impartial historian of the future, one believes that the claims of both workers will be clear. There are two facts that appear to emerge from a study of the historical record. The first was that the Italian workers were familiar with Ross' work; Grassi in his first publication in October 1898 (*Policlinico*) refers directly to it, and in his second paper in November 1898 (*Lincci*) refers to Sir Patrick Manson's account of Ross' work given at the July 1898 annual meeting of the British Medical Association, and states that he had received some of Ross' proteosoma specimens and mosquitoes from Manson. On the other hand, it is abundantly clear from the record that the Italian workers, and above all Grassi—who was both a distinguished entomologist and a distinguished protozoologist—had commenced work at the problem at the same time that Ross did; and that their claim that their work was entirely independent of that by Ross is a true and legitimate one. "Grassi may have been, and probably was, influenced and guided to some extent by what he had heard of Ross' discoveries" writes Wenyon (1926, p. 910), "but nevertheless he and his co-workers were the first to obtain the absolutely scientific proof of the specific relation of anopheline mosquitoes to human malaria, and to follow the complete cycle of development of the three human malarial parasites in these mosquitoes, as Ross had done in the case of the parasite of birds." If Grassi had never published anything except his wonderful monograph of 1900, describing in detail the complete life-cycles of the human malarial parasites in anopheline mosquitoes, his claim to fame would still rest secure. As it was, he made many other important contributions both to zoology and to protozoology.

Personally, one would deplore this terrible warfare. Is it not time to bury the hatchet? The controversy has kept the Italian workers in ignorance of the huge volume of anti-malarial work which is going on in India; and the workers in India in ignorance of the work going on in Italy. To both Italy and India alike malaria is the most important problem of all; is it not time for both countries to take stock and make a friendly comparison of notes?

Whatever the true facts of the case, the conditions under which Ross suffered, and the immense difficulties which he had to encounter will never again, one hopes, face the medical research worker in India. To-day, thanks to the re-organization of the Indian Medical Research Department by the late Sir Pardey Lukis, and to the creation by Sir Leonard Rogers of the Calcutta School of Tropical Medicine conditions are utterly different; the problems are there, there is financial provision for their investigation, the only difficulty is to find men of the right type to investigate them.

If the science of medical protozoology was well established by the beginning of the 20th century, in common with many other branches of medicine and surgery, it received a great stimulus during the Great War. And here we come to further pioneer work, in this case in connection with the intestinal entamæbæ of man.

The study of these organisms goes back to the days of that wonderful pair of workers in India, Timothy Richard Lewis (1841—1886), and David Douglas Cunningham (1843—1914). Lewis was a Welshman, born in 1841, who had a most distinguished career as a student at University College and at Aberdeen. He entered the Army Medical Service in 1868, and was sent out together with D. D. Cunningham to India to investigate and report on cholera. They reached Calcutta in January 1869, and were shortly afterwards attached as "Special Assistants" to the Sanitary Commissioner with the Government of India. Together they studied cholera and other Indian diseases for about a dozen years, publishing during this time a number of important reports

on their researches. Lewis' first report (1870) deals with "the microscopic objects found in cholera evacuations," and contained the first account of the organism now known as *Entamoeba coli*. In 1882 Lewis was the first to discover the microfilariae of *Filaria bancrofti*; whilst he also discovered the filaria of the dog, and investigated the relationship of filariasis to chyluria and elephantiasis. His most celebrated memoir, however, was that of 1878 "On the microscopic organisms found in the blood of man and animals, and their relation to disease." This gives a detailed account of the spirochaetes of relapsing fever, and the first description of the rat trypanosome which now bears his name, *Trypanosoma lewisi*. He returned to England for good in 1883, on his appointment to the post of Assistant Professor of Pathology at the Army Medical School, Netley, and unfortunately died from pneumonia, apparently contracted as an accidental laboratory infection, in 1886 at the age of only 45.

"Lewis' place in the history of tropical medicine and medical parasitology is not difficult to define," writes Dobell (1922), "He was, like Manson, a pioneer..... If Manson is the 'father of tropical medicine' then assuredly Lewis is at least its godfather; for it will not be forgotten that, in addition to his personal contributions to science, he founded both in India and at Netley, a school and a tradition whose fruits are now visible to all the world in the researches and discoveries of the officers of the Indian Medical Service and the Royal Army Medical Corps..... Lewis was an honest man and an honest worker..... He was an indefatigable worker, and as conscientious and careful in the observation of facts, as he was cautious and clear in their interpretation." And Dobell goes on to mention that shortly before his death Lewis had been recommended by the Council of the Royal Society for election to the Fellowship—an honour which he did not live to see consummated.

Concerning the career of D. D. Cunningham (1843—1914) I have been able to gather only very few particulars, and those chiefly from an obituary notice by Sir David Prain. He was a son of the Free Kirk of Scotland, and educated at Edinburgh. He entered the Indian Medical Service in 1868, went on a tour with Lewis on the continent to study mycological methods, and arrived in India with Lewis in January, 1869. Most of his service was spent in Calcutta as Professor of Physiology at the Calcutta Medical College. Although most of his publications deal with the cholera enquiry, he was essentially a worker in cryptogamic botany, and gave much valuable advice to Government with regard to cinchona plantation. One of the things for which he will always remain famous was the establishment of the small laboratory in the Calcutta Zoological Gardens, in which so many famous men have worked, but which—alas!—is to-day deserted and neglected, a most valuable field for study lost. He was also especially associated with the Indian Museum and the Asiatic Society of Bengal.

Cunningham further investigated the amœbæ which Lewis had found in cholera stools, and gave a detailed description of both the motile and the encysted phase. Dobell (1919, p. 72) quotes, exhaustively from this account, and concludes that "nobody who reads Cunningham's account and studies his pictures can fail, if he knows this organism, to recognize in them the commonest of the intestinal amœbæ of man—*Entamoeba coli*." Cunningham also gave accounts of both *Trichomonas hominis* and *Chilomastix mesnili*, but neither of them are as accurate as his account of *E. coli*. Still later he was the first person to see *Leishmania tropica*, as the colour plate illustrating his memoir, now in the museum of the Calcutta School of Tropical Medicine, clearly shows. The staining methods of those days were crude, however, and he was not able to correctly interpret the structure or morphology of these organisms, and it remained for Leishman at Netley in 1903 and independently for Donovan in Madras in the same year to give the first recognizable account of the leishmania parasites. With regard to his work on intestinal organisms, unfortunately Cunningham later was led astray by the finding of flagellate protozoa together with entamæbæ in the

same stools into ascribing all the forms which he had accurately observed and described into the life-cycle of a single suppositious organism, which he named *Protomyxomyces coprinarius*, and regarded as a sort of Mycetozoon.

"Cunningham was an able and sound scientist" writes Balfour (1925), "most accurate, honest, and careful, but with a critical faculty perhaps unduly developed..... He will always remain not only one of the leading names in the annals of the Indian Medical Service, but a pioneer to whom great credit is due for his painstaking researches." The climate of Calcutta however ruined his health and he retired as an invalid to Torquay in 1898, to devote himself to his garden, his books, and his canine friends.

Lewis and Cunningham did not name the amœbæ which they studied in Calcutta, but simply used the term 'amœbæ.' They were right in assuming that this species was in no way pathogenic. *Entamoeba histolytica* was first discovered by Lösch in 1875 in Petrograd, and he rightly regarded this species as pathogenic to man. Lösch also used no specific name for his organism; he uses the term 'Amœba coli,' non-italicized, and even then with some hesitation.

The subsequent history of the study of the entamœbæ of man has been dealt with in full detail by Dobell (1919, p. 27). It is a tale of disaster, of chaos piled on chaos, of confusion becoming worse confounded. Distinguished names occur in the record, but not much distinguished work. By 1918 *E. coli* had been described under 22 different synonyms, and *E. histolytica* under 33, and hardly a month passed without the discovery of some 'new amœba of man.' Then came the Great War. The belief by that time was universal that almost all the dysentery of the tropics was of amœbic origin, and British and Indian troops alike fighting on tropical war fronts were drenched with emetine, which was given in drastic and most dangerous doses. How many hundreds or even thousands were crippled by this 'treatment' one will never know, but one does know of army officers whose cardiac mechanism was permanently damaged by it, and who had to be invalided in consequence.

The first attempt to get matters right was made by Walker, even before the war. In 1911 Musgrave and Clegg (1904, 1906) had upheld the quaint thesis that "all amœbæ are or may become pathogenic..... The whole of the surface flora of the Philippine Islands carries a large number of these parasites. Some of them, at least, belong to the class which produces disease in human beings." Walker (1911) clearly differentiated the free-living amœbæ of the Manila water supply from the entozoic entamœbæ, showed that *E. coli* and *E. histolytica* were different species, and finally in 1913 in conjunction with Sellards experimentally proved the mode of transmission of entamœbic infections.

The war, however, made a careful study of the subject imperative, since dysentery is such an important war disease. In 1915 large numbers of troops from the eastern war areas began to arrive in Great Britain; dysentery was very rife on the Gallipoli and Egyptian fronts, and protozoological examination of an enormous number of stools was called for. This work was begun by Dr. C. M. Wenyon, but was taken over at the end of 1915 by Mr. Clifford Dobell, M.A., F.R.S., now Protistologist to the Medical Research Council of Great Britain. Dr. Wenyon was transferred to Alexandria, where, in conjunction with Dr. F. W. O'Connor, he commenced similar investigations on troops from the Gallipoli, Salonika, and Palestine fronts.

The results of these researches were, and are to-day, of fundamental importance. In 1917 there was published Wenyon and O'Connor's *Human Intestinal Protozoa in the Near East*, a most valuable, though perhaps slightly incomplete, work. Then in 1919 came Dobell's great work, *The Amœbæ living in Man*.

*The Amœbæ living in Man* is characteristic of all Mr. Dobell's work. It is no hurried or sketchy compilation, but the result of intense and extensive personal work of the very highest order, of mature thought and reflection. Its contents cannot be assimilated at a single

reading; it is a book to study again and again and again; also it is full of most valuable practical laboratory instructions, and based upon very extensive personal investigation. It was followed in 1921 by a second, excellent work, Dobell and O'Connor's *The Intestinal Protozoa of Man*. To the student in India who wishes to familiarize himself with the intestinal protozoa of man, the best advice that one can give is to study these two books again and again, and to constantly examine the stools of sweepers, who, from the nature of their duties, sooner or later pick up most of the infectious concerned.

As will be seen, our knowledge of the blood-inhabiting protozoa of man had been built up by degrees; whilst the war work cleared up the confusion with regard to the intestinal protozoa of man. It is probable that by now all, or almost all, of the human protozoal parasites are known. It is time to mention the question of literature and textbooks. Doflein's great work, *Lehrbuch der Protozoenkunde*, was first published in 1901, but was available only to students who could read German. It was followed by Minchin's *Introduction to the Study of the Protozoa* in 1912. Edward Alfred Minchin (1866—1915) may, indeed, be said to have been the founder of the British school of protozoology. Essentially a cytologist and zoologist, Minchin was a master of technique. For many years he was Assistant to Sir Edwin Ray Lankester and Demonstrator in Comparative Anatomy at Oxford, during which period he published brilliant and valuable work on the sponges. In 1905 he joined the Sleeping-Sickness Commission in Uganda, where his knowledge of insect anatomy and dissection were invaluable to the Commission, and where, with Gray and Tulloch he discovered the occurrence of wild trypanosomes (*T. grayi*) in the tsetse, which the recent work of Hoare (1929) has now shown to be an evolutionary stage of *T. kochi* of the crocodile. In 1906 he was appointed to the then newly-established Professorship of Protozoology in the University of London, tenable at the Lister Institute, from which Institute he published a series of ever memorable papers, dealing chiefly with the life history of the trypanosomes, and the inter-relationships of the Hæmosporidiidea. His *Introduction to the Study of the Protozoa*, however, was his most notable contribution to science. For many years it was the constant and familiar companion of those of us who were trying to teach ourselves a little protozoology. Finally, in 1926, came Wenyon's sumptuous *Protozoology, a manual for medical men, veterinarians, and zoologists* in two volumes. It has been followed by several smaller works. In 1923 there was no textbook of medical protozoology in the English language; to-day perhaps there are too many. That alone shows how rapid has been the progress of the science.

I have attempted, gentlemen, to sketch as briefly as I could, the amazing and rapid growth of medical protozoology, almost the newest and latest of the medical sciences to evolve. There are dozens of other names which I should have mentioned, other discoveries of importance, whilst I am incompetent to touch upon the allied development of the science of pure protozoology itself. In connection with India, there are two other names, however, which I cannot pass over. The first is that of Vandyke Carter (1831—1897), who discovered the Indian strain of the spirochæte of relapsing fever, and proved its infectiousness by experiments upon himself: he also described the organism of rat-bite fever in the rat, and correctly concluded that this organism is a *Spirillum* and not a spirochæte. The second is that of Sir Leonard Rogers, who, when he succeeded in 1904 in cultivating *Leishmania donovani* *in vitro*, was the first worker to cultivate a protozoal parasite on artificial media. That discovery was the precursor of much work of very great value; to-day, in my own department, for example, the routine diagnosis of kala-azar, of malaria, of infections with intestinal entamœbæ and flagellate protozoa, is carried out very largely by cultural methods.

Let me, however, gentlemen, draw my moral and conclude my tale. Medical protozoology has been very largely built up by medical men with no zoological training, and it has suffered in consequence. The 'student



mind' is not given to everyone, whilst the critical spirit is still more rare, and the untrained and ill-informed tyro does not hesitate to rush into print. Errors and dogmas have been laid down, which it has taken many years of careful work and patient observation to correct.

Yet the importance of medical protozoology in the practice of medicine in the tropics is very great. Now, what is the position with regard to the medical curricula in the different universities of India? In my opinion the syllabuses in pathology in India everywhere pay too much attention to morbid histology, and far too little to parasitology. The practising physician in India does not need to be able to diagnose an osteo-chondro-sarcoma microscopically; he can send a portion of the growth to a laboratory expert for diagnosis. But if he has not been trained in microscopical technique, if he cannot identify a malaria parasite, or differentiate between the different entamoebæ living in the intestinal tract of man, his work will be shoddy and sterile. He may commence his professional career as a physician, i.e., one who does his best to diagnose the disease from which his patient is suffering, and to treat it appropriately; no matter how much money he makes, nor how many honours descend upon him, he will end it as a quack, content merely to treat different *symptoms* as they appear, and to leave the issue to the healing hand of Nature.

"As a profession" writes Dobell, "protozoology still hardly exists..... But the science has now become so vast, from the amassing myriads of complicated details, that it can no longer be regarded as an occupation for anyone but a highly trained specialist. The amateur toying with his microscope, the ordinary zoologist or physician working in occasional vacations or leisure hours snatched from practice, can no longer be expected to make any solid contributions to protozoology. In future all great advances in knowledge must come from those who are bred up as protozoologists..... Unless the protozoologists can build solidly, and not too slowly, they will lose their advantages. Unfortunately no adequate provision has yet been made for the training of workers in protozoology. At present there are in Britain and elsewhere few first-rate professional protozoologists, and few competent teachers, but a large number of day labourers and dabblers from other sciences. Protozoologists are still mainly recruited from other professions. The remedy for this state of affairs will be found only when protozoology is recognized as a separate science—an occupation for specialists and not for smatterers; and when encouragement is given to its development by the founding of professorships in the subject—or similar appointments—in the larger universities. These professorships must be primarily for research, and secondarily for teaching purposes. The professor must have ample time and funds for teaching himself, and for carrying out his own researches. If he is sufficiently gifted to do both these things, he will be able at the same time to teach his science to others who will follow in his footsteps. But the time has now gone by when the junior demonstrator in zoology, or the lecturer in general parasitology in the medical schools can expect to 'take up' protozoology for a term or two and thereby profit science or himself."

I do not suggest that medical protozoology should be added as a separate subject to the already overloaded medical curriculum in the Indian universities, but the time has come when the important protozoological discoveries of the present and of the past should be incorporated in the general practice and teaching of medicine in India. The medical student should be taught more parasitology, and, perhaps, less morbid histology.

One further remark, and I have done. The day of the great pioneers is over; the field has been so well reaped that the first harvest has been garnered. But there remain for solution an immense number of more detailed problems. These call for team work; the medical protozoologist can no longer enter his laboratory and lock its door. He may require at any moment the co-operation of the entomologist, the bacteriologist, the chemist, and—above all—the biochemist, the last-named species of individual being one whom all directors of major

laboratories dream about, but rarely or never succeed in obtaining. Where are the workers in this subject coming from in India, unless we envisage the problems ahead and train men for these duties? We, in India, have a tradition to uphold. Let us attempt to live up to it.

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## AN ACCOUNT OF A BRIEF TOUR WITH THE MALARIA COMMISSION OF THE LEAGUE OF NATIONS.

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It may be of interest to readers of the *Gazette* to know something of the methods of work of the Malaria Commission of the League of Nations which so recently toured India, since there are many lessons with regard to malaria control to be learnt. Thanks to the courtesy of Mr. Senior-White, Malariologist to the Bengal-Nagpur Railway, and of the Bengal-Nagpur Railway, the writer was permitted to accompany the Commission on their tour of the Singhbhum district, 28th to 31st October, 1929, and saw much that opened his eyes as to the reality and problems of malaria control in one of the most hyperendemic areas in India.

The Commission arrived in Calcutta on 23rd October, 1929. Thursday, 24th October, was devoted to the Calcutta School of Tropical Medicine. In the writer's laboratory what appeared to impress the Commission most was that the routine diagnosis of malaria is here being carried out by cultural methods, an advance even upon the study of thick films, and a valuable method for ascertaining whether the patient has or has not been freed from all parasite infestation as the result of treatment. In Dr. Strickland's laboratory the methods of malaria control in the Duars and in Assam were shown; in Colonel Lloyd's laboratory the results of a study of the changes in the serum proteins in malaria—an investigation of great importance, since its bearing on methods of diagnosis and treatment is obvious. Mr. M. O. T. Iyengar also gave a splendid exhibit of the very important work which he is doing in the study of the anophelines of Bengal, their breeding habits, seasonal variations, and the natural parasites of anopheles. In the afternoon a conversazione was held at the School for the purpose of enabling the members of

the medical profession in Calcutta to meet the members of the Commission. On Friday morning, 25th October, Mr. Senior-White and the writer laid before the Commission the results of their studies of the geographical and seasonal distribution of species of malaria parasites, with special reference to the work carried out in India during the present century, and also discussed the future problems in malaria awaiting investigation. Each member of the Commission was presented with a typed copy of the 120 pp. of the manuscript dealing with India, and a copy of the new India map, 4 by 3 feet, showing the distribution of parasite species in man in India. A discussion ensued in which Dr. Bentley and Colonel Acton took part, and the discussion was then adjourned until the party should re-assemble in the train. The afternoon was devoted to seeing the work of the Anti-Malaria Co-operative Society in Bengal.

The party re-assembled at Howrah station at 4 p.m. on Monday, 28th October, in time to catch the Bengal-



The members of the Malaria Commission of the League of Nations.

Reading from left to right they are:—

- Dr. Louis Williams (United States).
- Professor de Buen (Spain).
- Dr. Peltier (France).
- Professor Swellengrebel (Holland).
- Professor Schüffner (Holland).
- Professor Cuicá (Rumania).

Nagpur Railway Bombay mail. It consisted of the following members of the Commission:—

- Professor Schüffner (Holland).
- Professor Swellengrebel (Holland).
- Professor de Buen (Spain).
- Professor Cuicá (Rumania).
- Dr. Peltier (France).
- Dr. Louis Williams (United States).
- Major J. A. Sinton, V.C., I.M.S.

Mr. R. Senior-White, F.R.S.E., Malariologist, Bengal-Nagpur Railway, was in charge of the tour. In addition, the following also accompanied the party:—

Lieut.-Col. J. A. S. Phillips, I.M.S., Director of Public Health, Bihar and Orissa.

Dr. R. N. O. Moynan, Medical Officer, Adra, Bengal-Nagpur Railway (who joined at Amda).

Mr. G. Fitzgerald, Assistant Transportation Officer Bengal-Nagpur Railway (who joined at Dangoaposi) and the writer.

The party was accommodated in a saloon tourist car attached to the end of the Bombay mail.

At this point, one would like to pay a tribute to the most admirable arrangements made throughout the tour

by the authorities of the Bengal-Nagpur Railway. The programme was carried through without a hitch, and in absolute comfort. Every possible arrangement had been made beforehand; the catering was admirable, excellent meals being served in the dining car in the most outlandish places, and a special word of praise is due to Mr. Fitzgerald for his powers of organization, and of dealing with any emergency. The writer must confess that the trip has thoroughly spoilt him as regards travel as an ordinary passenger.

The saloon car had a drawing room with comfortable accommodation for 12 at a central table, and, as we ran out of Howrah station each member of the party was presented by Mr. Senior-White with a most elaborately prepared file of 18 documents, maps, etc., dealing with the tour. He first drew our attention to the spleen index malaria map of India drawn by Christophers and Sinton, of which each of us was presented with a copy. On this map was superimposed the Bengal-Nagpur Railway system. The result was extremely striking; there can be no doubt that the Bengal-Nagpur Railway system traverses the most intensely malarious tract of India, and the need for a special malariologist for this railway, and of the utmost efforts to deal with the disease was very obvious. As we ran through the water-logged tract of Santragachi, Mr. Senior-White explained that here the spleen rate is under 10 per cent (including both that due to malaria and to kala-azar), but the sick pay loss to the railway from malaria at this station is more than Rs. 5,000 a year. Here the anopheline breeding-sites shift about, and until the introduction of Paris green control appeared impossible, but thanks to this substance something may be possible in the future when considerations of finance enable this station to be taken up. Everywhere throughout the area from Howrah to Santragachi are better class Bengali houses lying deserted; partly this is due to the natural tendency towards migration into Calcutta city, partly to malaria, partly to kala-azar. Generally, in this area the railway simply has to put up with malaria as something which cannot be controlled by present day methods. The situation is part of the general Bengal malaria problem, and cries out for intensive research.

Conversation being nearly impossible owing to the noise of the train, the members of the party were next left to digest the information in the voluminous file presented to each of them, the various points in which were explained by Mr. Senior-White to different members of the party in turn. Amda junction was reached after dinner, and here the saloon car was detached from the Bombay mail, and a special train made up. This consisted of a dining car, the saloon tourist car for the Commission, Mr. Senior-White's saloon, Dr. Moynan's saloon, and a third class carriage for servants. This was attached to a goods train for Dangoaposi. (At 10-30 p.m. we struck something with a bang—probably a wandering cow—but it did not disturb the serenity of the goods train!)

*Tuesday, 29th October.*—The train reached Dangoaposi station at 5 a.m. and Mr. Fitzgerald's saloon was attached, also a brake van. We were now detached from the goods train, given an engine to ourselves, and became a "special."

The real interest of the tour now commenced. We were moving through intensely picturesque country, forested hills arising from richly fertile plains largely covered with paddy, intersected by streams—"Derbyshire-like" country, in fact. To the eye of the uninitiated this country would appear to be of the nature of a health resort. Actually, it is a death trap. During the railway construction a semi-permanent camp was erected on the summit of a low, forest-clad hill, in a most picturesque spot. But at the foot of the hill incessant seepage led to intensive anopheline breeding—chiefly *A. funestus*; within half a mile of the newly constructed bungalows for the staff was an aboriginal village whose inhabitants were drenched with malaria. Blackwater fever and malignant tertian malaria ravaged the engineering staff; the camp had to be abandoned as the future site of an important station, and a new site selected.

Passing through Noamundi, we were again shown country where malaria control is financially impossible. On either side of the line rice fields stretch for miles, and are fed by springs from the low hills, which arise in a multitude of places in the paddy land. The station staff at Noamundi consists of two Indian officials and six aboriginal menials. To attempt control of this area would be immensely expensive, and the proposition is not worth it. Infection of running train crews in this area is avoided by keeping the trains conveying the iron and manganese ore up at the mine heads in protectable and protected areas until they can get a clear run through Noamundi station, especially at night.

We now entered on the steepest gradients on the whole Bengal-Nagpur Railway system, approaching Messrs. Tata's iron mines at Noamundi. The soil practically consists of pure iron ore, and the railway cuttings run through what is almost pure ironstone. The mineral wealth is here so rich that ore which would be worked for all it is worth in Europe is discarded, and only the purest ores, which are almost pure  $Fe_2O_3$ , are worked. The train now stopped and we were met by Mr. G. G. Dobbs, the Chief Superintendent of the mines; the Resident Manager, Mr. Maitra; Dr. Sen, the Assistant Medical Officer to the mine; and Mr. Roy, B.Sc., the Malaria Inspector.



Fig. 1.—The special train for the League of Nations' Malaria Commission on the Bengal-Nagpur Railway, at Dangoaposi Station.

Malaria control at Noamundi mine is something which must be seen to be believed. One doubts whether even in far-famed Panama there is anything like it; it is probably one of the most complete and perfect schemes of control anywhere in the world. It is in charge of Mr. Roy, a B.Sc. in engineering, with an unlimited labour staff to help him, and as much dynamite as he requires.

We were led first to the superintendent's office. On the wall of this office hangs a large blue print map, 5 by 4 feet in area. On it is marked every spot that requires oiling; S.W. for standing water; S.P. for seepage; R.W. for running water. Taking the power house and the dak bungalow as the two main foci at different ends of the mine an ellipse has been drawn with a half mile radius around these foci. Within this area control is absolutely perfect. At every point on the map where spots for oiling are marked a bone disc is hung showing the next date when the spot should be oiled. When it has been oiled the date is entered on the disc, and it is the duty of the malaria inspector to see that the spot has been oiled on the date in question.

Control was first initiated here in July, 1929. The mine was surveyed by Sir Malcolm Watson with Mr. Senior-White as a preliminary measure in March, 1929. At that time the spleen rate was 58 per cent. amongst aboriginal children, and 40 per cent. amongst the children of imported superior Bengali families. At Noamundi railway station it is 83 per cent. amongst aboriginal children. The anophelines found breeding were *A. culicifacies*, *maculatus*, *funestus*, *karwari*, and *jeyporiensis*. The



problem to be faced, therefore, in the malaria season of 1929 was no inconsiderable one.

The word 'mine' is rather a misnomer for Noamundi iron mine, for the ore is quarried from the hillside, and the area consists of several densely forested hills with valleys and ravines between. The chief source of anopheline breeding was the bed of the Kurta river which traverses the entire length of the estate from one end to the other, fed by innumerable seepages, and running in a boulder-strewn bed. This river has been trained throughout the entire longitudinal axis of the protected area. On the side where heavy monsoon rain is most likely to scour out the ravines and destroy the trained bed of the river, protective masonry walls have been built. Every seepage has been sub-soiled. And "sub-soiling" means something at Noamundi mine. It means constructing a channel some five feet deep and three feet wide, filled with rocky boulders, and covered in with graded stones and finally earth; also all trees with four feet of the drain are dug out. Dynamite has to be used freely, for the soil is practically pure iron ore. But labour is unlimited, though only a qualified engineer could have carried the scheme through. In one place there was a bad seepage down three sides of a hill enclosing a shallow valley; at an expenditure of Rs. 12,000 the entire hillside has been sub-soiled, and a cement edged reservoir constructed at the foot of the hill. A second large seepage also cost about the same sum to deal with. Everywhere seepage water has been led underground and delivered into the main stream by a protected outlet. In every spot where standing pools may be left by the river, and along its margins, oiling is practised. On the reverse side of a big hill looking away from the main river bed a large hillside has had to be dealt with. Channels have been dynamited and cut, and the entire hillside drained dry of water.

The malariologist often dreams of the ideal example of "a malaria-free enclave within a malaria-ridden district." At Noamundi mine, this ideal is realized. Dr. Williams, one of the most active members of the Commission, spent the entire morning of five hours trying to find mosquito larvæ; his only catch during this period was a single Chironomid larva. Noamundi mine is now entirely free from both larval and adult anophelines, and the only cases of malaria which occur are relapses. The chief problem remaining is a village of aborigines and contractors' labour just outside one end of the protected elliptical area, on the banks of the Kurta river. Here there is free anopheline breeding and an intense malaria incidence. The question is whether this village will act as an anti-malarial screen for the protected area, or whether it is a danger focus. Opinions expressed by different members of the party differed on this point.

In addition to malarial engineering on this estate, it may be added that all residential bungalows are screened. The labour population consists very largely of aboriginal Hos, Sonthals, Tantis, and the like, and at the mine hospital Professors Schüffner and Swellengrebel carried out an investigation into the adult spleen rate in these tribes.

What malaria control costs at Noamundi mine, one did not enquire. It was obvious that such principles are only applicable by some of the wealthiest commercial concerns in India. What the Commission thought of it, we shall know when their report is published. It is significant, however, that there were 18 cases of blackwater fever on this mine in 1928; there have been none since the control commenced.

The special now returned to Dangoaposi station, and after tiffin Mr. Senior-White demonstrated to us the malaria control at this station.

Here conditions are utterly different from those at Noamundi mine. In the first place there is, relatively speaking, no money at all; hence anti-malaria measures have to be of the cheapest kind. Yet the position here is an extremely serious one. At Dangoaposi station the entire traffic from the iron and manganese mines above is marshalled, goods trains are made up for transit to Messrs. Tata's huge iron works at Jamshedpur, and the Indian Iron and Steel Coy. at Burnpore, and—in

connection with the manganese industry—for transit to the coast for loading on sea-going vessels for transshipment overseas. The entire population at Dangoaposi station only consists of some 240 persons employed by the railway, with about the same number of dependents; but the station handles approximately half a million sterling's worth of goods traffic a year, and hence malaria control is here imperative.

Malaria at Dangoaposi railway station is almost entirely man made (as it is in the majority of malarious areas in India). Here the railway cuts through a cutting with steep banks from which seepage incessantly accumulates in borrow pits by the side of the line. On one side of the line rice fields stretch away to the nearby foothills. To one side of the line the railway engineers had dug a lengthy storm water channel, badly constructed, and an incessant source of anopheline breeding. Matters were so bad that in September, 1925, before control was started, the incidence of malarial attacks among the running employees was 287 per cent. for that month; i.e., each employee had approximately three attacks of malaria during that month. Engines lay idle on various sidings since there was no one well enough to drive them, and the mineral traffic was almost at a standstill. Control was commenced, on the appointment of Mr. Senior-White as Malariologist to the railway, in November, 1925.

An interesting point about Dangoaposi station is that Mr. Senior-White has here found spleen rates in children of no value as an index to the intensity of malaria in railway employees. The employees enjoy the right of free railway passes for themselves and their families; hence the child community is constantly altering, families being brought into the station and others sent to their homes elsewhere. It has been found at Dangoaposi that case incidence in employees alone is of value in railway work.

For malaria control at Dangoaposi, Sub-Assistant Surgeon B. M. Swami, the only medical officer in the place, receives an extra allowance of Rs. 10 p. m. over and above his pay. He has also the services of one gang mate at Rs. 17 p.m., and of six coolies, each at Rs. 15 p.m. One can here only simply congratulate Dr. Swami on the magnificent results accomplished with so small a staff. His work is typical of the quiet, unostentatious work in malaria control which is going on all over India, but whose existence is hardly ever recognised.

Only two main measures are possible at Dangoaposi. Swamps and borrow pits have been filled up with waste ash from engines, the borrow pits on the two sides of the line being connected together, and a flowing channel created. The storm-water channel has had to be re-dug throughout and trained for a distance of a mile or more.

Taking the usual half mile radius from the residential station quarters, complete protection has been afforded by these measures, and by regular oiling. The work is incessantly and systematically carried out, and frequently supervised. Mr. Senior-White indeed informed us that Dangoaposi was called his "spiritual home." Taking the most intensely malarious months of the year, the results have been as shown on the following page.

Apart from the cost of the share of the salary of the malariologist to the railway, the entire cost of the operations at Dangoaposi station works out at Rs. 2,353 per annum, or about Rs. 6 per head per annum of the population resident in the station and railway quarters. How severe malaria is in the unprotected stretch of the railway in this area may be gathered from the fact that, during the few days that the Commission was on tour in it, the death of one railway guard from blackwater fever was reported, and the occurrence of three severe attacks of malignant tertian malaria amongst others. Dr. Moynan, who accompanied the party, also suffered from a very severe attack of malignant tertian malaria during the tour, contracted somewhere on his district, which includes all the hyperendemic area of Chota Nagpur.

Dangoaposi station presents a malaria control almost as perfect as that at Noamundi mine, but at absolutely

Year and month.		Incidence of malaria per cent. of running staff.	Residents.
September, 1925	Before control.	287	62
October, 1926	After control.	79	4
October, 1927	During this year Mr. Senior-White was at Delhi, and the B. N. Ry. was without a malarialogist.	207	39
September, 1928		27	10
October, 1929		8	5

minimal cost. It is obvious, however, that at the former place incessant vigilance has to be exercised, for any falling off in the control will immediately be accompanied by a wave of epidemic malaria. What little residual malaria remains is due to anophelines from outside the controlled area, i.e., from the vast area of rice fields around the station. These could not be controlled, except at prohibitive cost; probably dusting of Paris green from an aeroplane would be necessary. In passing, it is of interest to note that Mr. Senior-White has decided to neglect *A. fuliginosus* altogether; it is a frequent breeder in rice fields, but appears to be without danger.

The moral of Dangoaposi station is, we believe, applicable to vast tracts in India, and especially to big commercial concerns in India. The members of the Commission did their best to find a mosquito larva in the controlled area, but failed. Professor Swellengrebel, with the true critical spirit of the research worker, then demanded to be led outside the controlled area; he discovered anopheline larvæ immediately.

On returning to the train, and after tea, discussion of the paper by Mr. Senior-White and the present writer was resumed. The "attack" opened as one had expected it to. Despite the fact that the authors had done their best to search the entire literature locally available on the subject during the present century, every member of the Commission present complained that no end of important papers and reports from his country had been overlooked. (This is inevitable; the resources at our disposal were limited; and the memoir—if it ever sees publication—is intended as something basic on which it is hoped that others will build; a first attempt, rather than a complete exposition, which we know to be impossible.) Extraordinary differences of opinion developed during the discussion. Thus some workers regarded Leishman's stain as invaluable in the diagnosis of malaria, others regarded it as entirely unreliable. There was complete unanimity on one point; that the work by Jancsó in 1904 on the limitations which different degrees of atmospheric temperature and humidity exert upon the transmission of malaria by *Anopheles* mosquitoes needs complete re-investigation with reference to different countries in the tropics which is urgently necessary. Ultra-important as Jancsó's fundamental experiments are, yet they refer to only one species of *Anopheles*—*A. maculipennis*, studied at only one season of the year, and under European conditions. His conclusions do not necessarily hold true for the many different carrying species of *Anopheles* in different tropical countries.

The stimulus of such discussion of malaria problems with research workers in malaria from several different countries does not need emphasis. One learnt at every stage of the discussion. New view-points were constantly

arising, and the lesson was driven home on one more and more that malaria is an international problem, and that for its control international programmes have to be devised.

*Wednesday, 30th October.*—The special train moved at dawn from the siding at Dangoaposi station to Bāra Jamda. This permitted Professors Schüffner and Swellengrebel to visit Jamda village, and again examine adult aborigines with reference to their spleen rate. (The point which these two workers were investigating, especially, as far as one could ascertain, was whether the spleen rate among adult aborigines does or does not differ as markedly as it is popularly supposed to do from the spleen rate among aboriginal children.)

The train then moved on again, and at 8-30 a.m. we arrived at Messrs. Bird and Co.'s manganese mine at Uluburu. Here we were met by Captain Duxberry, the Manager; Dr. Sircar, the Medical Officer; and Mr. B. S. Mathur, the Malaria Inspector. (Mr. Mathur is one of the pupils from Lieut.-Col. Dunn's training school in the United Provinces, and one can only say that his work at Uluburu is worthy of that school.) The staff which Dr. Sircar and Mr. Mathur have for malaria control in this mine consists only of one mate and six coolies, nothing more can be afforded.

Here, again, the main malaria problem centred around a river which runs through the estate. There were 3 cases of blackwater fever (among the staff) in 1925; 3 in 1926; 2 in 1927; and 1 in 1928. As at Noamundi, here again, a main stream runs through the estate, and surveys by Mr. Senior-White in April and September 1928, had shown *A. culicifacies*, *funestus*, *maculatus*, *barbipennis*, *karwari*, *fuliginosus* and *theobaldi* breeding in its pools. Again, control within a half mile radius was instituted at the commencement of the present season.

Here one of the chief solutions to the problem of anopheline control in the stream is a matter of applied hydraulics; labour cannot be spared to fill the marginal swamps which are breeding carrier species, but mining debris is shovelled into the main stream when it is in flood and this is allowed to percolate into the breeding areas concerned, the stream being diverted from the main channel where necessary. Oiling of course is also resorted to, as necessary.

Finally, we came to one of the world's mine wonders, "J. S. quarry," or—as one would prefer to term it—"Larvicide Lake." This is a disused manganese quarry which has filled up with rain water and seepage into a medium sized lake. Its water is absolutely inhibitory to the breeding of mosquito larvæ; they simply cannot live in it.

Larvicide Lake presents a problem for malaria workers throughout the world, and it is no wonder that it held the members of the Commission spell-bound. Its



Fig. 2.—Larvicide Lake, with the members of the Malaria Commission in the foreground.

banks are the edges of the old manganese quarry. There is a slight growth of grass at its edges, but little vegetation. There are numerous fish in the water, but

not apparently especially larvæ eating fish. Yet this water will not allow mosquito larvæ to breed in it; it is in brief Nature's own cure for the malaria problem. Experiments have been carried out in shallow pools with this water; grass and algæ were introduced and *Anopheles* females allowed to deposit their eggs. When so exposed to the rain and air this water retains its larvicidal properties for three weeks, but not for four weeks; at the fourth week of exposure breeding commences, but not before. At the shallow end of the lake, where the water is diluted with recent rainfall, a little breeding of larvæ may occur, but never at its deeper end. Further, the water of this lake is periodically pumped into the main stream and apparently immediately sterilises it of mosquito larvæ.

Chemical examination of the water of this lake reveals nothing of special importance. The Chemical Research Department of Messrs. Bird and Co. report that the most probable constituents of the mineral matter contained are as follows:—

Calcium carbonate	..	4.00	parts per 100,000
Magnesium carbonate	..	2.69	" "
Sodium chloride	..	1.31	" "

"In addition to this, the water contains 1.614 parts of suspended solid per 100,000 parts of water. This solid matter contains 10 per cent. of ferric iron. We cannot see how by any stretch of the imagination, these minute quantities of mineral salts—commonly present in river and spring waters in much greater amounts—can have any effect on mosquito larvæ. The ferrous iron and manganese together total less than 5 parts in every 100 million parts of water; they cannot possibly have any influence on mosquito life."

In spite of the research chemists, however, Larvicide Lake remains a reality. Here is this extraordinary lake whose waters prevent mosquito breeding. Possibly its existence may be of interest to the Indian Research Fund Association. No algæ were observed in the water, but its larvicidal action is apparently not dependent upon depriving the larvæ of this means of nutrition, for when the water is admitted into the stream below swarming with mosquito larvæ, it immediately clears out all larval breeding.

A thorough examination of water within the control area at Uluburu in September 1929, three months after control commenced, showed that breeding had been entirely eliminated, only four larvæ in one small spot missed by the oil being found. It is not easy to present results in figures, as coolies from other and unprotected camps are scheduled to the two hospitals, but it is significant that in 1929 there have been no cases of blackwater fever, and little trouble from malaria in the clerical staff at Uluburu.

At the hospital at Uluburu an interesting case of "Sarandha ulcer" was exhibited. This resembles Naga sore, or *ulcus tropicum*, but there is no foetid odour accompanying the discharge. Professor Schüffner took films from the sore for subsequent examination.

We next enjoyed Captain and Mrs. Duxberry's most welcome "liquid" hospitality, then walked back to the special train, and now commenced a very slow journey to Barabil station, *en route* the train being slowed down to four miles an hour to permit us to see the local conditions. The Uluburu river here spreads out into a wide stretch of rice land without a regular channel, overflowing which it runs through the railway borrow pits in twin streams. The mining camp unfortunately located along the hillfoot here is not economically protectable, and the only solution possible will be to close the existing camp and move it to a protectable area some way on at the end of the branch line.

At Barabil the party divided into sections. Professors Swellengrebel and Cuicá investigated the spleen index among adult aboriginal women who were attending the weekly market at Barabil, which happened to be in progress. Professor de Buen, with Lieut.-Col. J. A. S. Phillips, I.M.S., Dr. Moynan and the present writer went off in a Chevrolet over 7 miles of jungle road to investigate conditions in a completely uncontrolled area.

Drs. Schüffner, Peltier, Williams, and Major Sinton stayed behind to see a demonstration of how a stream running through swamp land can be made to cut a bed for itself, and so dry the swamp.

The party re-assembled at 1 p.m., and the carriages were attached in turn to the passenger train from Bara Jamda to Amda, run again as a special to Tatanagar, and were then attached to the Ranchi express, and reached Howrah station at daylight on Thursday the 31st October, 1928.

During the afternoon of the 30th a full discussion of what had been seen during the tour took place. Dr. Williams stated how gratified he was at all that had been done to ensure the comfort of the Commission, and how impressed they had been with what they had seen. A controversial attitude was assumed quite early in the discussion by Professors Schüffner and Swellengrebel, who stated that they regarded malaria as more than a 100 per cent. spleen rate as concluded therefore that malaria in its most intensely hyper-endemic areas in India could not compare with conditions in the Dutch East Indies. Further, Professor Swellengrebel considered that control within a half mile radius of the area concerned was quite inadequate. Here he was interrupted by Dr. Williams, who stated that in the Southern United States they had started with the idea of control within a radius of one mile, had reduced it to three-quarters of a mile, then to a radius of half a mile, and had found results to be equally good in most cases.

Professor Swellengrebel however considered that the range of flight of malaria-carrying anophelines in India appeared to be remarkably less than in the Dutch East Indies. At this point, Mr. Senior-White explained that, with regard to malaria control on railways in India, what was to be aimed at was what was practicable, with regard to the meagre funds available, rather than what was ideal. A half mile radius may be relatively inexpensive, but if a one mile radius is to be insisted on, the proposition may be beyond the realm of the practicable; funds will simply not permit it. He considered that the actual working examples which he had shown the Commission of practical control within a half mile radius proved his point that such control was both reasonably efficient and reasonably cheap.

Finally, some difference of opinion was expressed with regard to the breeding places of *A. culicifacies*. Mr. Senior-White pointed out that this species, if hunted, can take refuge in the usual breeding sites of *A. rossii*, and thus complicate the problem to an extent not realized by workers from the Further East, who have not this species to combat.

The discussion carried us through till dinner time, and Tatanagar was reached shortly afterwards. The saloon cars were here attached to the end of the Ranchi express, and Howrah station was reached at 5-30 a.m. on the morning of the 31st. The saloon cars were here detached and run into a siding to allow everyone to dress at leisure.

\* \* \* \*

The programme which the Commission carried through during their tour of nearly five months in India was a very strenuous one. India is accustomed to cold weather visits by Commissions; but a Commission which comes out to study malaria in India during the actual malaria season, and visits the most intensely malarious tracts in this country, not without some risk of malaria to the members of the party, is a novelty. It will be seen how many problems with reference to malaria control were raised in this one short trip alone. What impressed the writer more than anything else during the tour was the invaluable opportunity which it afforded for workers in India to compare notes with workers from other tropical countries, and the stimulus of the discussions.

Malaria is an international tropical disease. One hopes that this first visit of the Commission to India is but the initial stage towards the evolution of an international organization under the League of Nations for malaria control.

# Indian Medical Gazette.

JANUARY.

## THE USES AND ABUSES OF VACCINES.

ALTHOUGH the theoretical justification for the employment of vaccines is dependent on the work of Pasteur and his immediate successors, the practice of preventive inoculations has been in existence for many centuries amongst the members of earlier civilizations and even amongst primitive peoples. The earliest practice of vaccination consisted in giving the disease itself to a healthy person at a suitable age period or on some suitable site in order to obviate subsequent infection at a more susceptible age or on some part of the body which would cause disfiguration; examples of these practices are the habit of placing young children in contact with others suffering from small-pox and the inoculation of oriental sore on some covered part of the body. The next step was the inoculation of a living attenuated virus, examples of which are cow-pox and the fixed virus of rabies. Both these inoculations protect against the disease produced by the fully virulent organism.

It was some years after Pasteur's discovery that the injection of not only living but dead cultures of bacteria would protect an animal against the effects of subsequent inoculation by a living culture of the same organism that vaccines came into general use as prophylactic and therapeutic agents. Following up the work of Koch, Sir Almroth Wright introduced the smaller, controlled dosage with tuberculin and later anti-typhoid inoculation, and, although his method of controlling the dosage by means of the opsonic index has now fallen into disuse, it can be said quite truly that he was mainly responsible for "popularizing" vaccine therapy.

Though for many years prior to 1914 vaccination had been employed as a public health measure, the War gave a great stimulus to preventive inoculation against other diseases, and towards the end of 1918 almost every soldier in each fighting force had been inoculated against enteric and small-pox, and, for those stationed in tropical areas one must add, plague and cholera. This, so to speak, broke the ice, and it is now a common incident for large civil populations not only to submit, but actually to clamour for wholesale inoculation. The use of vaccines as a therapeutic measure has now ceased to be a novelty, and has passed out of the hands of the specialist and bacteriologist into those of the general practitioner and manufacturing chemist. That the reputation of vaccine therapy has suffered from this change of control it is needless to say, and to-day there is a feeling amongst certain practitioners that vaccine therapy is a passing fashion which will soon be condemned to oblivion. In this opinion they are just as wrong as their fellow practitioners, and possibly

they themselves a few years earlier, who hailed vaccines as the cure for everything. There is a certain type of individual who is an excellent student and absorbs all the knowledge that his textbooks and teachers can impart up to the moment he obtains his medical degree, but who from henceforth depends entirely on the advertising columns of the medical papers and the catalogues of the manufacturers of pharmaceutical substances for his subsequent education. In the hands of this individual it is not surprising that vaccines are unsuccessful. The fault does not lie with the vaccines, but with the practitioner. When Jenner wrote to William Hunter telling him his theories regarding the possibilities of vaccination, the latter replied, "Don't think, try; be patient, be accurate." Only too many practitioners take the first half of this advice. They don't *think*, "Is there any other cheaper, equally efficacious remedy," but they just *try* a staphylococcal vaccine on a patient suffering from impetigo, when a better result could be obtained by the application of unguentum hydrargyrum ammoniatum dilutum. When they have a chronic sinus to deal with which previous surgical treatment has failed to cure, they don't *think*, but send to the bacteriologist for an autogenous vaccine and possibly close up the opening of the sinus, turning it into an abscess cavity, instead of combining surgical treatment with the vaccine therapy and thereby producing a permanent cure.

The object of giving a vaccine is to give a stimulus to antibody production, and is particularly suited to chronic infections where the infection is not sufficiently acute to produce the requisite antibody response. In acute infections the body has already more toxins than it can deal with and the addition of the vaccine can only have the same effect as does whipping a very tired horse; he may decide to give up the struggle altogether. In any case it takes a number of days to produce an immunizing effect and in the meanwhile the patient will either be better or dead; for such acute infections ready-made antibody in the form of anti-serum should be employed. Another point which is not fully realized is that for the vaccine to take effect the antibody must be able to reach the focus of infection; where this is not in direct contact with the body fluids, for example in the case of very superficial infections or abscess cavities, no results can be hoped for. In most infective processes there are more than one organism at work; the most easily isolated one is very frequently not the one that is the main cause of the trouble and a vaccine made from this organism will naturally give very disappointing results. Individual susceptibilities have to be considered; though natural immunity to disease is high in old age, little increase in immunity can be brought about by inoculation. Again most Indians are very susceptible to tuberculin, but to other vaccines they are hyposensitive. There are many conditions in which a stock vaccine is more valuable than an autogenous one, and by knowing this the

physician may save the patient considerable expense; but there are others in which an auto-genous vaccine is essential and in such cases money spent on stock vaccines will be wasted. Finally, vaccines are not likely to produce anything but temporary improvement if the original focus of infection is not eradicated or the portal of entry of the septic organism is not closed. For example, it is useless to attempt to treat a joint affection by means of a streptococcal vaccine if the ulcer in the intestine through which the organisms are entering is left untreated.

No physician would ever send a patient to the chemist with a request for "medicine" without stating the nature of the medicine and without instructions as to its application, yet nine out of ten physicians consider that they have done their duty completely when they send a patient to a bacteriologist simply with a request for a vaccine; the *thinking* has to be done by the bacteriologist, yet only too frequently his most explicit instructions are entirely ignored.

During the last twenty years much scientific work has been done on the subject of vaccine therapy; its value and limitations are appreciated by the bacteriologist and the specialist, but the future of vaccine therapy is dependent on the general practitioner's acceptance of it as a valuable weapon against disease worthy of serious study.

L. E. N.

## Medical News.

### THE MADRAS EYE HOSPITAL AND THE INTERNATIONAL OPHTHALMOLOGICAL COUNCIL.

Our readers will join with us in congratulating Lieut.-Col. R. E. Wright, C.I.E., I.M.S., of Madras on his appointment to the International Ophthalmological Council. The position of the Madras Eye Hospital in world-ophthalmology is so prominent that it is only fitting that its Superintendent should be appointed to the Council. The following extract is taken from the *British Journal of Ophthalmology* for November 1929, p. 588:—

The International Ophthalmological Council have decided to hold the next Congress in Madrid in April 1933. Professor Lundsgaard (Denmark) is the new President of the Council, and Professor van der Hoeve (Holland) and Dr. Pflugger (Switzerland) are Vice-Presidents. Mr. Leslie Paton (Great Britain) is the Treasurer and Dr. E. Marx (Holland) the Secretary. It was decided that four of the eight members of the Council should retire and that they should be chosen by ballot. The lot fell to Professor Axenfeld, Dr. Byers, Professor Ovio and Professor Meller, and their places were taken by Professor Oguchi (Japan), Professor Roselli (Italy), Professor Wagenmann (Germany) and Lieut.-Col. Wright (India). Dr. de Schweinitz resigned and his place has been taken by Dr. Walter R. Parker to represent the United States. The remaining three members of the Council served on the old Council—Professor Coppez (Belgium), Dr. Marquez (Spain) and Dr. Morax (France).

### BOMBAY MEDICAL COUNCIL.

The following summary of the proceedings of the meeting of the Bombay Medical Council held on the 2nd September, 1929, is published in the press for information.

1. The Council considered certain papers relative to the use by Mr. H. Ghose, a homœopathic practitioner,

of the following description after his name  
M.B.

and the use generally by  
(Homœopathic Physician)

homœopathic practitioners of medical titles which allopathic practitioners are entitled to affix to their names. Mr. Ghose having agreed to discontinue the use of the letters M.B. after his name, the Council resolved that a copy of the correspondence with Mr. Ghose be communicated to Government with an intimation that on the facts now elicited and having regard to the opinion of the solicitor no action under the Indian Medical Degrees Act appears to the Council to be necessary at present, but that taking into consideration the difference of opinion of the present solicitor to Government and of the former solicitor, and also the decisions of the Courts in previous cases, the Council consider that the opinion of the Advocate General should be obtained on the question.

2. The Council considered a representation from Mr. T. K. Phadke, M.B.B.S., and two others, practitioners of Panvel, complaining that under rule 2 of certain bye-laws framed by the Panvel Municipality under section 48 of the District Municipal Act, that Municipality has served them with notices for the payment of a "shop tax" on their dispensaries, such dispensaries being regarded as "shops," and resolved that the Government of Bombay be moved to exempt dispensaries kept by medical men from the operation of any bye-law as defined in rule 2 of the bye-laws of the Panvel Municipality.

3. The Council considered an application from Mr. John Michael Pereira, M.B., C.M. (Edin.), for the restoration of his name to the Bombay Medical Register whence it had been removed in 1926 under section 9 of the Bombay Medical Act, 1912, for unprofessional conduct in giving a medical certificate to a telegraphist without seeing him at the time of his illness, and resolved to accept the opinion of the Executive Committee that the name of Mr. Pereira may now be restored to the Register in view of a period of two years having elapsed since his name was removed and on account of his age.

4. The Council considered an application from Mr. Sobhagchand Vannali Shah for permission to be registered under section 7 (3) of the Bombay Medical Act and resolved to inform Government that as the applicant had not completed a course of training in any medical institution, the Council were of opinion that he should not be given the permission applied for.

5. The Council considered a letter from Government inviting the views of the Council on a proposal for the introduction of an Act for the registration of qualified dentists, together with certain other papers, including the draft of a Bill to give effect to the proposal, prepared by a Sub-Committee appointed by the Executive Committee, and resolved that the draft Bill as altered by the Executive Committee appears suitable; and that it should be submitted to Government with an expression of concurrence in the views of the Sub-Committee that until the Dental Board has had some practical experience of the working of the Act, the most economical arrangement would be to have the registration of dental practitioners undertaken by the same agency as the registration of medical practitioners, and that the incidence of cost generally should, in the beginning at any rate, be treated in the same way as is the expenditure connected with the Medical Council, i.e., by an annual grant from Government to meet such portion of the working expenses as may not be covered by the income derived from registration fees.

6. The Council considered certain papers received from Government relative to the recognition of the "M.D." of the American "A" Class Medical Institutions for the purposes of registration under the Bombay Medical Act, 1912, and resolved to inform Government that the Council were prepared to consider the applications of the American "A" Class Medical Institutions, provided those Institutions recognised the graduates of the Bombay University without the proviso of their degrees being subject to the recognition of the Examining Board in England.



7. The Council considered an application from Mr. J. M. Damany, M.B.B.S., F.R.F.P. & S. (Glasg.), for the registration as an additional qualification of the "D.L.O." (Lond.), which he had obtained, and resolved to inform him that it was not necessary to declare the diploma in question to be registrable in Bombay as an additional qualification.

8. The Council resolved to re-appoint Mr. Joseph Bocarro as Registrar for the year beginning on 1st November, 1929.

### THE LONDON HOSPITAL FOR TROPICAL DISEASES.

We have been asked by the publishers of the *Gazette* to draw the special attention of our readers to the appeal on p. xcvi of the advertisement columns on behalf of the Hospital for Tropical Diseases, Endsleigh Gardens, London. Medical men in India are not wealthy, but there must be very many old students of the London School of Tropical Medicine with happy memories of this splendid hospital, which admits sufferers of every class and of all races who come for treatment from all parts of the tropics. Anyone who has visited or worked in the hospital must have appreciated how well it is run; since its first inception by Sir Patrick Manson thirty years ago, it has a splendid record of service.

The appeal is to raise the sum of £35,000, which is required for (i) additional "middle income" beds; (ii) a new pathological laboratory; (iii) a new clinical lecture theatre; and (iv) the endowment of beds for the care of necessitous patients. Contributions should be sent to Lieut.-Col. the Right Hon. Sir Leslie Orme Wilson, G.C.S.I., G.C.I.E., C.M.G., D.S.O., Honorary Treasurer, "Tropical Hospital Fund," c/o Messrs. Thacker, Spink & Co., Calcutta.

Some of our readers who are old students of the London School may be attending wealthy patients whose interest might be aroused in this connection, and their help asked for.

### CALCUTTA SCHOOL OF TROPICAL MEDICINE AND HYGIENE.

EXAMINATION RESULT. L. T. M.

Session. July—September 1929.

*Passed with distinction.*

(Arranged in alphabetical order.)

1. Provat Kumar Kaviraj, L.C.P. & S. (Private Practitioner).
  2. Kalyan Singh Makhania, L.S.M.F. (Sub-Assistant Surgeon, Punjab Government).
  3. Mohd. Abdus Sami, M.B., B.S. (Sub-Assistant Surgeon, Punjab Government).
- Passed.*
- (Arranged in alphabetical order.)
4. Bilwa Mungal Adhicary, L.M.P. (Medical Officer, Lallachera Tea Estate).
  5. Kumudranjon Banerjee, L.M.F. (Local Indian Doctor under the District Board of Purnea).
  6. Subas Chandra Banerjee, B.Sc., L.M.F. (Kala-azar Doctor under Howrah District Board).
  7. Narendra Nath Barooah, L.M.P. (Subordinate Medical Officer, Kuliapani Tea Estate).
  8. Hans Raj Bhanmbi, L.M.P. (Sub-Assistant Surgeon, Punjab Government).
  9. Bhupendra Kumar Bhowmik, L.M.F. (Assistant Health Officer, Jalpaiguri District Board).
  10. Bhabani Prasad Chakravarty, L.M.P. (Sub-Assistant Surgeon, Government of Bihar and Orissa).
  11. Jamini Kumar Chakravarty, L.M.P. (Doctor, Helika Tea Estate, Upper Assam).
  12. Susil Kumar Chatterjee, L.M.F. (Private Practitioner).
  13. Kushal Singh Chaudhari, L.M.P. (Sub-Assistant Surgeon, Shahpura State).
  14. Lachhman Das, L.M.P. (Sub-Assistant Surgeon, Government of India).

15. Niranjan Das, L.M.P. (Sub-Assistant Surgeon, Gangpur State).
16. Ramanik Himatlal Desai, L.C.P.S. (Private Practitioner).
17. Henry Louis Francis, L.M.F. (Assistant Medical Officer, Bengal and North Western Railway at Barauni Junction).
18. Nalini Bandhu Ghosh Biswas, L.M.F. (Medical Officer, Serispore Tea Estate).
19. Kartar Singh Grewal, L.M.P. (Sub-Assistant Surgeon, Punjab Government).
20. Hem Chandra Guha, L.M.P. (In-Charge A. B. Railway Hospital, Haflong).
21. Chakrapany Ramchandra Iyengar, L.M.P., L.C.P.S. (Sub-Assistant Surgeon, Government of Madras).
22. Mohanlal Jareth, L.M.P. (Honorarily working in Balchand Hospital, Jhalrapatam City).
23. Codanda Bopanna Kariapa, L.M.P. (Sub-Assistant Surgeon under Coorg State).
24. Krishnaji Balwant Landge, M.B., B. & S. (Junior Assistant Surgeon, Railway Board).
25. Amarnath Marwah, L.M.P. (Sub-Assistant Surgeon, Punjab Government).
26. Priyanath Mukherjee, L.M.P. (Sub-Assistant Surgeon, Government of Bihar and Orissa).
27. Ramamurti Moni Patro, L.M.P. (Sub-Assistant Surgeon, Government of Madras).
28. Muhammed Abdul Rahmon, L.M.P. and College Diploma of Public Health, Madras (Medical Assistant, Health Department, Civil and Military States, Bangalore, Assistant Medical Officer).
29. Allada Sampson Anantha Rao (Sub-Assistant Surgeon, Government of C. P.).
30. Sudhindra Nath Raye, M.B., B.S. (Medical Practitioner).
31. Mir Mohd. Riaz, L.S.M.F. (Sub-Assistant Surgeon, Punjab Government).
32. Hira Lal Sachdeva, M.B., B.S. (Private Practitioner).
33. Kanapaka Satyanarayana, L.M.P. (Jail Sub-Assistant Surgeon, Jagdalpur, Bastor State).
34. Ayodhia Prasad Shukla, L.M.P. (Assistant Medical Officer, Government of C. P.).
35. Shivkumar Bhavanishanker Shuklya, L.C.P.S. (Honorary Worker, West Hospital, Rajkot).
36. Arumugam Theaga Ranjan, L.M.P. (Sub-Assistant Surgeon, Government of Madras).
37. Kangayam Subramania Thirumurthy, L.M.P. (Medical Practitioner, Chandragiri Taluq Board, Chittoor).
38. Pranlal Ranchhodlal Trivedi, L.C.P. & S. (Working as Sub-Assistant Surgeon on the Honorary Staff of the State Dispensary, Morvi, Kathiawar).
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## Current Topics.

### Therapeutic Progress : Tuberculosis.

(Abstracted from *The Prescriber*, Vol. XXIII, July 1929, p. 242.)

HELIO THERAPY AND ACTINOTHERAPY.—Strandberg discusses the treatment of tuberculous conditions, particularly laryngeal, by means of heliotherapy and artificial light. The best source of light is unquestionably the sun, but the limitations attendant on the use of sunlight are many, and a substitute is generally necessary. The carbon arc most nearly approaches sunlight, and gives better and quicker results than the mercury vapour lamp. It is possible to effect a clinical cure in lupus vulgaris as well as in tuberculosis of the larynx by means of universal light treatment alone, but the period of treatment may be shortened considerably by the employment



of local treatment simultaneously with the universal treatment. In his Institute the carbon arc bath has been used on 435 patients with rhinolaryngological lupus vulgaris, and he has effected cures in 86.6 per cent. Of 41 cases of aural tuberculosis, 32 were cured. Of 203 patients with laryngeal tuberculosis, 113 were cured. Patients with intrinsic involvement do better than those with extrinsic tuberculosis. Of those who suffered from hoarseness or aphonia the voice became clear in 90 out of 110 cases.

Laird reports the study of 220 cases of uncomplicated pulmonary tuberculosis, of which 110 received sun treatment and 110 merely hygienic and rest treatment during the same period. He concludes that heliotherapy, while not essential to recovery, is distinctly advantageous in patients with comparatively few symptoms or manifesting only slight activity and showing a tendency to fibrosis. In the more active cases of pulmonary tuberculosis so little is to be gained by it as compared with rest and fresh air that one should use discrimination in prescribing it. Its results are not spectacular, and its omission is not detrimental to the patient's interests.

Actinotherapy ("artificial heliotherapy") has been tried for several years in the Edinburgh City Hospital by Mekie, who reports somewhat disappointing results. Since 1924 all cases of surgical tuberculosis in which there was no definite contra-indication, such as pulmonary lesions or intolerance to light, have had routine treatment with a carbon arc lamp. No deleterious effects were observed, though some patients were found to be more tolerant to treatment by the mercury vapour lamp. While in many cases the clinical results were gratifying, the statistics show that cases of spinal and abdominal disease did well, those of hip disease were less satisfactory, and those of disease of the knee-joint and of the cervical glands showed no improvement. The average duration of stay in hospital was materially increased in all cases. Mekie concludes that actinotherapy, as a treatment for surgical tuberculosis, has been overrated, and that it does not change the fundamental principles of treatment of that disease. It is merely a useful aid to treatment, as are many drugs.

**GOLD COMPOUNDS.**—In a recent issue of *The Prescriber*, Dyson discussed the chemotherapeutic compounds of gold. These he classified in several groups: the cyanide group, which includes *Aurocyanan*; the aurothio group, including *Krysolgan*, *Solganal*, *Triphal*, *Lopion*, and *Allochrysin*; and the double thiosulphate of gold and sodium, known as *Sanocrysin*. After a description of the chemical and therapeutic properties of these compounds, it was shown that the whole question of gold therapy is complicated by two important factors. In the first place, the activity of gold compounds is greatly reduced in the presence of serum, the reduction factor being about one-thirtieth. Secondly, the peculiar nature of the infection against which the activity of these compounds is mainly directed—the tubercle bacillus—makes the use of any therapeutic agent one of great difficulty. Chemotherapy has always been faced with the problem of getting the active preparation to the spot where its activity is required, and in no other disease is this problem more acute.

**Sanocrysin.**—Reporting on the treatment of pulmonary tuberculosis by sanocrysin, Burrell (London) remarks that the most notable change is the diminution in the quantity of sputum and the disappearance of tubercle bacilli from the sputum; the chief indication, therefore, for the use of sanocrysin is when the sputum continues and contains tubercle bacilli. Another type of case in which this drug is useful is when collapse has been induced in one lung by artificial pneumothorax and the disease begins to spread to the other side; in such cases it is sometimes possible to check this development and thus to secure maintenance of the pneumothorax. In acute pulmonary tuberculosis sanocrysin has not proved of much value, but combined with pneumothorax it offers the patient a good chance. Collapse is induced in the worse lung, and sanocrysin is used to check the spread of the disease in the other lung. Burrell gives it by intravenous injection, starting with 0.1 gm.; if no reaction supervenes he gives 0.25 gm. three days later,

then at weekly intervals 0.5, 0.75, and 1.0 gm. If a reaction occurs after any dose, the dose is repeated after the reaction has subsided, or a smaller dose is given if the reaction has been severe. Complications noted in some cases were: albuminuria in about 50 per cent., but transient and mild; metallic taste in the mouth occasionally; vomiting in 20 per cent. but not serious; rheumatic pains in a few cases, severe in one case; slight febrile reaction in about 30 per cent.; erythematous rash in a few cases, in some cases severe; painful arm caused by injection outside a vein, relieved by sodium thio-sulphate. In the early days serum was given before sanocrysin to ward off complications, but Burrell has never found it of any value.

Stobie and Hunter report on its use in forty-five cases during the past two years. Sanocrysin, they conclude, cannot be regarded as a specific in the treatment of pulmonary tuberculosis, though in suitable cases it shortens the period of routine treatment, and there is greater possibility of the improvement following institutional treatment being maintained. In carefully selected cases it is of value as an adjuvant to other methods of treatment. In bilateral disease it will help to clear the better lung and allow the establishment of artificial pneumothorax in the other. Used with care it is of value in the treatment of the acute exacerbations in chronic fibroid disease. By ridding the sputum of bacilli even for a short time it must limit the spread of the disease.

Heaf now records results in 97 cases of pulmonary tuberculosis. He concludes that, provided the patient has fairly good physique and no abdominal tuberculosis, and that other vital organs are normal, results with sanocrysin may be expected to be good. It is particularly useful in bilateral cases treated by collapse therapy. By suitable dosage all shock and unfavourable symptoms can be avoided, and the patient's weight should increase throughout treatment. The remote results are encouraging only in those cases which lose their tubercle bacilli and become clinically arrested after treatment. Sanocrysin is well tolerated by children, and has given encouraging immediate results in children suffering from pulmonary tuberculosis who did not respond to routine treatment.

Clarke and Haddick report a control observation on 97 patients, 57 of whom received sanocrysin treatment, the remaining 40 serving as controls. The results are given in considerable detail, and the general conclusion is that those treated with sanocrysin did better than those not receiving this treatment.

Several reports from France are worthy of notice. Farjon, Maizilly, and Lefevre think that untoward effects, when these occur, are the result of excessive dosage. In small doses sanocrysin is undoubtedly beneficial; the general health improves, cough diminishes and bacilli disappear from the sputum, weight increases, and fever progressively lessens. Improvement, however slight, often raises the patient's morale—an important factor in treatment. The doses given weekly by intravenous injection are: 0.05, 0.1, 0.15, 0.2, and 0.25 gm. this last dose being repeated until about 2.0 gm. has been administered. To avoid cumulative action, 40 to 60 days should elapse between the courses. Sanocrysin is of no benefit in acute tuberculosis, but only in the chronic febrile or subfebrile types. It is contra-indicated in cases with renal or digestive complications, in cases of advanced cachexia with hectic temperature, and tuberculous laryngitis.

Bernard and Mayer have administered sanocrysin treatment to 142 patients suffering from pulmonary tuberculosis. They do not regard it as a specific remedy for that disease, but they affirm that it has a definite therapeutic action. They do not credit it with bactericidal action: its effect is exercised on the lesion, at least in the lung.

A report by the Sanocrysin Research Committee of Japan is by no means encouraging. The most the report can say in favour of sanocrysin is that it is a stimulant in the stationary proliferative type of pulmonary tuberculosis. It was found that it caused but little

structural alteration in the tubercle bacilli, and did not deprive them of their acid-fast properties. Its germicidal action was extremely low, and no evidence was obtained that it had any lytic action on the bacilli. Therapeutic experiments with animals gave entirely negative results, and tests on tuberculous patients were equally disappointing. The general conclusion is that sanocrysin is not a specific agent in the cure of tuberculosis: that it does not directly destroy the bacillus; that it may be useful on occasion for stimulating cases of a stationary type which do not respond to the usual sanatorium treatment. On the other hand, it is an intensely toxic substance, and unless used with great care it may cause serious damage to the patient's tissues.

Two cases have recently been reported in which sanocrysin, under the influence of sunlight, caused pigmentation of the skin. Beaumont describes a lilac-coloured pigmentation of parts exposed to the sun in a patient who had been receiving sanocrysin. Savy reports a very similar case. This was successfully treated with sodium thiosulphate, at first 6 grains intravenously, and later 15 grains orally thrice daily being given, with local application of Lassar's paste.

*Vaccine Treatment.*—Raw reports further on the attenuated vaccine introduced by him some years ago. With the object of preventing tuberculosis in dairy cows and thereby reducing the surgical tuberculosis in children caused by infected milk, Raw has for the past five years immunized calves shortly after birth by giving them injections of vaccine from human bacilli. The results have been excellent, the immunity lasting for two years or even longer. Raw attributes the unfavourable results from tuberculin treatment to the use of virulent cultures of human bacilli. The disturbing reactions caused by such cultures are entirely obviated by the use of attenuated bovine cultures. In early infections his attenuated vaccine seems to give sufficient active immunity to enable the tissues to produce antibody to deal with the infection, and, what is of greater importance, to limit the spread of the disease in the organ affected. Raw says that a case of pulmonary tuberculosis should be treated by a vaccine prepared from bovine bacilli, and a case of surgical tuberculosis by a vaccine prepared from human bacilli. The dosage should be carefully graduated, and a course of treatment should consist of twelve weekly injections, the maximum dose being 0.01 mg. In no case are any reactions produced.

Jenkins\* having used Raw's attenuated vaccine, and subsequently various fractions of this and of a virulent strain, realized that such precautions were unnecessary since the method of detoxication used for residual vaccine rendered the virulent strain safe. As at first prepared, his residual antigen was liable to cause abscesses at the site of inoculation. He has now elaborated two antigens—No. 3, the principal, and No. 1, the auxiliary—which are free from this defect. No. 3 is composed of human and bovine strains of *B. tuberculosis* by a process described in detail. No. 1 is an auxiliary to the main antigen and is used only in a certain type of case. It is simply a saline extract of the human type of Raw's attenuated strain, and its preparation is described also. The immediate clinical results are described as satisfactory, approximately two-thirds of all cases of pulmonary tuberculosis obtaining appreciable benefit, though the duration of the improvement is at present unknown. The original paper should be consulted for details of preparation and methods of administration.

*Allergin.*—Jousset calls attention to a preparation *l'allergin*, extracted by a special process from the tubercle bacillus. It differs in some respects from tuberculin, the chief difference being that it has an antigenic therapeutic effect, while tuberculin is credited with having only diagnostic properties. Jousset used allergin treatment in all kinds of chronic tuberculosis, with or without fever, if the patient was not cachectic. More or

less pronounced immediate general, focal, and local reactions follow subcutaneous administration of allergin, after which is observed a transient amelioration of all functional symptoms and an improvement of the general condition; the physical signs of the tuberculous lesions, however, are not much improved. The amelioration may be maintained by one or two subcutaneous administration of allergin a month. Jousset explains the good effect of the treatment not only by the immunizing properties of the allergin itself, but also by the auto-immunization of the patients in response to the focal reactions.

*Crystalline Tuberculin.*—Seibert claim that the active principle of tuberculin is protein in character. Mention was made of the production by Seibert of this protein in crystalline form. Recently Seibert has published a full account of the investigations leading to this discovery. Evidence is presented to show that a water-soluble protein of the nature of an albumin has been obtained from tuberculin in crystalline form, and that this crystalline protein has been recrystallized as many as fourteen times without loss in its specific biological activity—a fact which leaves little doubt that the active principle of tuberculin is a protein. This crystalline tuberculin is extremely potent, but is unstable and easily becomes denatured, which explains the very small yield of crystals obtained. Seibert suggests that, if the specific toxic factor in tuberculin is a protein, the tuberculin reaction must be an allergic protein reaction.

*B. C. G. Vaccine.*—The work of Calmette, of the Pasteur Institute, Paris, directed towards the protection of infants and young children by means of "B. C. G." or *Bacille-Calmette-Guerin*, a living culture of highly attenuated bacilli, has recently been the subject of much writing. Calmette himself has issued a further report, bringing his results to September 1928. The mortality among the vaccinated infants has been only 2.3 per cent., while that among the non-vaccinated was as high as 18.5 per cent. Calmette thinks that with revaccination at the end of the first and third years, and possibly also at the ages of 7 and 15, a single injection of one-twentieth or even of one-fortieth of a milligram of "B. C. G." should confer permanent immunity. In France alone nearly 100,000 children have been vaccinated with "B. C. G."

Unfortunately Calmette's enthusiasm was not shared by all of his colleagues, some of whom attempted to discredit the method. A rather heated controversy resulted, from which Calmette appears to have emerged triumphant. The subject has been investigated by the Section of Hygiene of the League of Nations, whose report is presented by Bernard. The result of this investigation is to show that "B. C. G." is unlikely to produce tuberculous lesions (one of the accusations made against it), and that it confers a certain degree of immunity. The conference, however, suggested that the League of Nations should engage expert statisticians to go into the question of collecting and analysing the mortality and morbidity tables of infants vaccinated and unvaccinated.

Meanwhile many reports, both favourable and the reverse, have appeared in medical literature. According to Poix the Pasteur Institute has, during the past seven years, sent out more than 300,000 doses of "B. C. G." vaccine. Not a single accident has been reported; even disturbances in digestion or in growth have not been observed. A slight micropolyadenitis has occasionally been noted, but this has always disappeared in a few weeks and has had no effect on the general condition of the infant. A study of the records of over 3,000 vaccinated infants under one year of age and living in a tuberculous environment shows a general mortality of 3.1 per cent., whereas the mortality for unvaccinated infants, regardless of environment, is 8.5 per cent. For infants aged from 1 to 3½ years and exposed to familial contagion the tuberculosis mortality among the vaccinated is only 0.2 per cent., whereas among the unvaccinated of the same age it is seven times as great. As yet it is impossible to state with certainty the duration of the immunity conferred by "B. C. G." vaccine. Poix thinks that all new-born infants should be vaccinated. The

\*Jenkins, C. E. The treatment of pulmonary tuberculosis with a residual antigen: method of preparation and clinical results obtained: *British Journ. Tuberc.*, 1928, July, pp. 126—136.

subcutaneous route, however, should be reserved for specially organized clinics, and only the oral route should be used by the general practitioner. This limits the use of "B. C. G." vaccine to the first ten days of extra-uterine life, because it has been shown that the digestive mucosa is permeable for bacilli only during the first few days of life.

Leuret and Caussimon review Calmette's work and criticize his conclusions that "B. C. G." vaccine is entirely innocuous and completely efficacious. A new strain of the tubercle bacillus of extremely low virulence has been evolved, but experimental evidence by no means proves that these bacilli are incapable of giving rise in ultra-susceptible subjects to tuberculosis. Further, it is too soon to state positively that the vaccination is absolutely preventive against tuberculosis. A small number of vaccinated infants have died of the disease; and Calmette himself admits that it is not immunity which is conferred by vaccination, but only a greatly increased resistance to tuberculosis. They contend that not until the present vaccinated infants have passed safely through the critical stage of puberty to adult life can final proof of the value of "B. C. G." be forthcoming. Meanwhile they doubt the wisdom of vaccinating infants who are not exposed to infection, though strongly recommending it in those whose environment would render contagion inevitable.

Weill-Halle and Turpin have made 613 peroral and 23 subcutaneous vaccinations with "B. C. G." and conclude that it is harmless. During the first ten days of life it can be given perorally, three doses being given according to Calmette's prescription; this should be repeated when the child is one year old and again when it is three years old. After the first ten days of life the vaccine may be given subcutaneously if two negative cutireactions have been obtained at 8-day intervals. The dose subcutaneously is from 0.01 mg. to 0.5 mg. The vaccinated infants should be isolated to preclude the possibility of infection during the period of immunization.

Troisier and co-workers, as the result of certain experiments with old men, and because tuberculosis has been observed in persons of over 60 years, advocate preventive vaccination with "B. C. G." in all adults and even in old persons.

Calmette's statistical methods are criticized at some length by Greenwood, who shows that the figures given by Calmette are fallacious or misleading. The percentages, he says, are based on totals too small to give an accurate estimate, and in some cases they are not even correct. The positive evidence of a statistical character as supplied by Calmette is ambiguous.

Wallgren advocates intradermal vaccination as against the peroral method. He does not consider a child properly vaccinated unless it becomes tuberculin sensitive after inoculation. He has done some comparative experiments on the vaccination of new-born children, partly with peroral administration, using the French doses of, in all, 30 mg., and partly with the intradermal inoculation of 0.1 mg. Those treated intradermally were tuberculin sensitive after some weeks, while those inoculated perorally quite failed to show such sensitiveness. It will be a long time, however, before one can amass in intradermally vaccinated children statistics such as those given by Calmette. Wallgren can only say that so far no child vaccinated by his method has developed any tuberculous disease after exposure in its home.

Petroff and colleagues are doubtful about the ultimate harmlessness of "B. C. G." vaccine. The "B. C. G." organism in its undissociated form is only slightly virulent for guinea-pigs and rabbits. Its virulence can doubtless be kept at a low level by cultivation on laboratory medium, but the human body is different from laboratory medium. It is impossible to predict what changes may occur in course of time if "B. C. G." is implanted in the human body and is accidentally carried from one human being to another. There are indications that an avirulent micro-organism may be transmuted into a virulent form by cultivation on a medium containing its antiserum. Petroff and his co-workers believe, therefore, that the

use of "B. C. G." in prophylactic immunization may be a dangerous procedure.

Experiments with "B. C. G." vaccine as performed by the Ukrainian Commission are reported by Tzekhnovitzer. The conclusions arrived at by the commission are as follows:—(1) Calmette-Guerin bacilli injected in small or large doses into healthy or weakened guinea-pigs produce only localized lesions with a retrogressive tendency; even successive passages from one animal to another never result in progressive tuberculous processes; (2) Calmette-Guerin bacilli introduced into guinea-pigs which are thereafter subjected to repeated injections of tuberculin do not increase in virulence; (3) cultures of "B. C. G." isolated after one or two passages in the guinea-pig were not virulent; (4) the tissue culture method permits demonstration of the non-virulence of "B. C. G."; (5) the vaccination of laboratory rodents with "B. C. G." gives relatively good results; (6) the vaccination of cattle with "B. C. G." confers a definite resistance to experimental intravenous injection of virulent tubercle bacilli; (7) the "B. C. G." eliminated in the milk of cows is completely avirulent; (8) studies made over a period of more than two years prove that the use of "B. C. G." for the preventive vaccination of new-born infants is harmless. The very low mortality from tuberculosis observed in vaccinated infants in an infected area is in favour of vaccination by Calmette-Guerin's method.

Heynsius van den Bergh vaccinated ninety infants according to Calmette's method, keeping them from the source of infection for 10 to 12 days. (Calmette prescribes a month). Careful examination showed the children to be free from tuberculosis before exposure. One child died of congenital syphilis at the age of two months; enlarged mesenteric glands containing tubercle bacilli were found, but no tuberculous changes could be detected in these glands. The method appears therefore to be harmless. Twenty cases were observed for at least eighteen months, and fifty control cases were used for comparison. One death took place among the vaccinated children; nine among the controls. The remainder of the vaccinated children appear clinically free from tuberculosis, but x-ray examination reveals signs of the disease in the lungs of a few, although the disease appears to be benign.

Chiari, Nobel, and Sole find that intraperitoneal treatment of guinea-pigs with "B. C. G." does not protect them from subsequent infection, although in some instances life apparently is prolonged. They regard the efficacy of immunization with "B. C. G." vaccine as very questionable.

Kraus finds from experiments on guinea-pigs and rabbits that "B. C. G." possesses a certain virulence, but that the processes which in excites tend to remain localized and the lesions to disappear completely. He thinks that it is too early to give out the vaccine for general use in human beings.

Munoyerro records his observations on 757 infants at the Foundling Hospital at Madrid who had been inoculated with "B. C. G." vaccine. The general mortality was 28.5 per cent., as compared with 35 per cent. among 1,174 infants who did not receive the vaccine, and the mortality from tuberculosis 2.24 per cent., as compared with 4.25 per cent. among the controls. Munoyerro concludes that, in view of the smaller number of cases of tuberculosis found among the vaccinated, the "B. C. G." vaccine is not dangerous. It does not invariably protect against tuberculosis, though possibly in the vaccinated cases in which tuberculosis was found the infection was of intra-uterine origin, or so massive an amount that vaccination had no power to control it. He thinks that before the employment of "B. C. G." is generalized or its use made compulsory it should be restricted to maternity hospitals and orphanages, or to patients living in an infected environment, from which the vaccinated subject should be immediately removed.

*Artificial Pneumothorax.*—The employment of artificial pneumothorax in the treatment of pulmonary tuberculosis has been a recognized method for about quarter of a century, its effects being particularly good in cases where.

the disease is limited to one lung and the pleura is free. Good results have been effected also in bilateral cases with the aid of sanocrysin, collapse being produced in the worse lung while sanocrysin is used to check the spread of the disease in the other lung. This method has already been described in the section dealing with sanocrysin.

A statistical study of the efficacy of artificial pneumothorax has recently been presented by Rist and Hirschberg. The after-history of patients so treated at the Laennec Hospital is compared with that of others who did not submit to the treatment, being unwilling or unable to do so. The classes are not strictly comparable, but the results offer a fair comparison. The patients selected numbered 759, and were suffering from unilateral disease, tubercle bacilli being constantly present in the sputum; the controls numbered 463. At the end of the period under review (1912 to 1926) 52 per cent. of the treated patients were clinically healed, being free from symptoms, showing no tubercle bacilli in the expectoration, and being able to lead a more or less normal life; 32 per cent. were dead, and the remainder either unimproved or worse. Approximately 54 per cent. of the controls had died, and none of the remainder was fit for employment or had ceased to be infectious. If the number of patients showing signs of progressive disease be added to the deaths, the percentage for treated cases is 44 and for untreated 82. A further study of patients treated and untreated between 1919 and 1921, and since observed for seven years, shows 90 per cent. of deaths among controls and little over 40 per cent. among treated patients, while of the treated patients 35.8 per cent. were classed as healed. Nearly half of the deaths among treated cases occurred in the first two years following induction. It is noticeable that the mortality among females greatly exceeded that among males; this is attributed to an inferior power of resistance. Rist and Hirschberg find that after the fifth year the danger of relapse is not great.

### The Radiational Treatment of Corneal Ulcers.

By W. S. DUKE-ELDER, M.A., D.Sc., Ph.D., M.D., F.R.C.S.  
(*The Brit. Med. Journ.*, July 13th, 1929, p. 41.)

In a previous paper in this *Journal* a preliminary account was given of the application of ultra-violet light to ophthalmological diseases. Subsequent experience, extending to well over a thousand cases, has wholly confirmed the opinion then tentatively put forward; but the results of radiational treatment applied locally to ulcerative conditions of the cornea merit a separate and more detailed account.

The action of ultra-violet light is primarily abiotic—that is, destructive. The most obvious effect produced in the radiation of a cell is the photochemical denaturation and subsequent coagulation of its proteins. This, with other reactions, involves the production of a certain amount of trauma, which may lead to the partial or complete destruction of the cell, an effect which is now well recognized in the desquamation of the outermost layers of the skin after radiation. In the tissues of the eye a precisely similar reaction takes place; with small intensities of radiation the cells are injured, with great intensities they are destroyed. It is this end, under proper control, which is desired in the treatment of ulcers of the cornea, and the active response which the traumatism of light evokes repairs, and more than repairs, the damage which is done.

Histological studies carried out on the cornea of rabbits which were subjected to radiation with ultra-violet light in doses considerably above those which may be used clinically, show no observable change after radiation until four hours have elapsed, when, in both the superficial and basal cells of the epithelium, some spacing out and oedema are evident. The nuclei of some of the more superficial cells then show the presence of acidophil

granules, which take on a sharply defined eosin stain. After six hours these same changes are much more generally evident, and the arrangement of the superficial layers becomes somewhat irregular. The pathological changes are most striking after twelve hours. A large number of the nuclei of the epithelial cells take on the red stain markedly; some remain granular, in others the granules appear to have coalesced to form amorphous red "inclusion bodies," and a nucleus may contain a very large number of the former or be entirely converted into one or two of the latter. At a later stage these inclusions tend to bulge out the nuclear membrane, giving the nucleus a polymorphic shape, and finally they may be extruded altogether into the cytoplasm. Thereafter, if the cell is a superficial one, it appears to be cast off. At any stage before this the process may stop and the cell return to normal in appearance and staining reaction. From twelve to twenty-four hours after radiation desquamation is proceeding in the central area, around which there is frequently, but not invariably, a heaped-up region of proliferating epithelium. Meanwhile the substantia propria shows somewhat similar changes, which gradually decrease in intensity in the deeper layers, and from the limbus an infiltration spreads, composed very largely of eosinophils, although some polymorphonuclear cells are present. After thirty-six hours this limbal infiltration becomes more marked, blood spaces of considerable size are seen, and the eosinophils, which preponderated initially, are largely replaced by a massive invasion of polymorphs.

About fifty hours after radiation the epithelium near the periphery becomes more regularly arranged, and over the desquamated area a single layer of cells, the nuclei of which show no acidophil properties, begins to appear. The process of regeneration goes on with surprising rapidity and little evidence of cellular activity until, at seventy-six hours, the epithelium is two or three layers thick. At the limbus vascular infiltration is at its height; large new blood spaces, frequently surrounded by young fibroblasts, are present in great numbers, while the whole tissue in this region, and for some considerable distance into the cornea, is infiltrated with blood cells. This marked vascular reaction at the limbus seems to be a secondary feature, and is not evident histologically until the abiotic changes are well advanced; it is probably stimulated by the absorption of the products of protein disintegration. In seven days the cornea is again entirely normal.

### Therapeutic Effects.

It is probable that the therapeutic effect of ultra-violet light when applied to the cornea in inflammatory, ulcerative, and degenerative conditions depends on the following factors. In the first place, pathogenic micro-organisms in the most superficial layers of this tissue will be directly killed. The lethal action of short-waved light upon such organisms is well known, and in a transparent tissue like the cornea this bactericidal power will be much more effective and extend more deeply than in an opaque and highly absorbent tissue like the skin. Where there is much inflammatory reaction and infiltration present in the superficial corneal layers, however, the greater part of the abiotically active rays will be absorbed, and in this case any lethal effect will necessarily be slight and practically restricted to the surface; but in proportion as some degree of transparency remains, bactericidal action will be greater and extend more deeply. In the second place, the superficial cells of the diseased corneal epithelium are killed and cast off with contained bacteria. Thirdly, the intense vascular reaction at the limbus and the invasion of the cornea by blood cells and inflammatory oedema will flood the diseased area with bactericidal influences. Fourthly, the stimulation to rapid and healthy regeneration of the exfoliated epithelium is a beneficial factor in any type of ulcer, but one which becomes of first importance in chronic and recurring conditions. Finally, it is probable that the absorption of the products of disintegration of the proteins of the cells will exert a favourable influence over the local immunological mechanism.

### *The Biological Action of Ultra-violet Light upon the Lens.*

We have seen that the traumatization with the subsequent active response which ultra-violet light rays evoke, when used in clinical doses, is the action which is desired in the cornea. In the lens, however, the case is different. This is an avascular tissue in which active repair is comparatively lacking, and consequently any damage which may be done to it tends to be cumulative. Coagulation of the proteins of its cells is recognized clinically as cataract, a condition which has been produced experimentally by radiation with ultra-violet light. With radiation of such intensity as does not produce an opacity, changes take place in the colloid system of this tissue which result in the proteins becoming more labile and their subsequent coagulation by other influences more easy. Moreover, the autoxidation system of the lens, upon which it probably depends in large measure for the maintenance and regulation of its metabolism, is damaged by ultra-violet light; while, in addition, the permeability of the capsule is altered, thus further increasing the susceptibility to pathological changes. It has been urged that, in the comparatively small doses in which ultra-violet light is used clinically upon the eye, there is little fear of causing permanent damage to the lens; but it is to be remembered that small doses, such as have no apparent effect, produce physico-chemical changes which predispose to the formation of cataract. In addition, in many diseased eyes the possibility of a complicated cataract without any artificial stimulus is by no means remote. In any technique of local phototherapy, therefore, it is essential that the lens be excluded from the path of the incident rays.

### *Clinical Technique.*

In the treatment of corneal ulcers by ultra-violet light the first essential is that the beam should be adequately controlled so that it may be limited to the diseased area; in this way unnecessary traumatism to the healthy parts of the cornea is avoided, and the lens is excluded altogether from the path of the rays. For this purpose I have introduced an "ophthalmic radiation lamp," which has been already described in detail elsewhere. In principle it is a modified Gullstrand slit-lamp fitted with a mercury vapour lamp instead of the usual nitra lamp, and provided with an optical system of quartz, mounted on a freely movable arm. The last lens in this system is capable of accurate focusing and fine adjustment in two planes by means of an Arruga screw arrangement, and the precise incidence of the beam is controlled by observation through a Zeiss binocular corneal microscope. Interposed in the beam is an adjustable diaphragm and a system of filters, by means of which the nature of the light employed can be varied. For therapeutic purposes the ultra-violet light is employed unfiltered, but a screen which cuts off the abiotically active rays (such as uviol glass or Crookes's B) is useful for examinations for diagnostic purposes; with these all the advantages of a slit-lamp with red-free light are attained. With such an instrument a beam of considerable intensity and any desired size can be used, its incidence can be adequately observed and controlled, and in all cases, it is easy to avoid the lens by inclining the beam at a sufficient angle. The most convenient procedure to adopt is to instil cocaine into the eye, which is followed by fluorescein, which is again washed out by cocaine. The patient is then set down to the radiation lamp, and, a uviol filter being interposed in the beam of light, the nature and extent of the ulcerative process are examined through the microscope. A remarkably beautiful and well-pronounced fluorescent effect is produced in this way, and the depth and extent of the disease are clearly delimited. The beam is adjusted so that it plays upon the ulcerated area, and no other region of the cornea, and the uviol filter is thereupon turned off and the unfiltered light allowed to play upon the eye. If the patient is unable to keep his eye open during the whole time of the treatment there is no disadvantage in interruptions, for intermittent exposures, within very wide limits, are additive in their

effects, and have the same accumulative action as a single long exposure.

Other methods have been proposed from time to time. Koeppé (1919) and Birch-Hirschfeld (1922) employ a carbon arc as the source of light, but this emits a very large amount of heat; infra-red rays readily penetrate into the tissues of the eye and are potent for harm, especially to the lens, while any attempt to filter them off necessarily reduces the intensity of the abiotic rays. Ascher (1922) uses a quartz rod as a director along which the ultra-violet rays are guided, but although such a method is very suitable for radiating the conjunctiva, it is impossible in this way, in the case of cornea, to control the beam of light with sufficient accuracy.

### *Dosage.*

In radiating the cornea extreme care must be exercised with the dosage. I have found experimentally that the intensity of light required to produce a response is very slightly less than that required to produce an erythema upon the skin. It is to be noted that, as occurs in the skin, the response varies with different individuals; consequently the ideal method is to test the erythema dose on the skin of the arm of each individual patient, and to commence radiating the cornea with a dose slightly less than this. In many corneal ulcers, however, it may be inadvisable to wait the twenty-four hours necessary for the development of the cutaneous reaction, and in these cases it may be necessary to start treatment immediately with an average dose. This may be taken as representing a period of radiation lasting three to three and a half minutes with the apparatus described, where the mercury vapour lamp is of the atmospheric pressure (K.B.B.) type, and runs on 220 volts, 2 to 3 amperes. Once the initial dose is obtained and its reaction observed subsequent doses are based upon it, but any increases are to be graduated with care, for it must be remembered that a small increase will make the difference between a mild and a violent photophthalmia.

Since the beam is always kept at a focus upon the cornea, the distance of the lamp from the cornea is constant, and the dosage can be altered only by time. Allowance must be made, however, for the obliquity of the rays, for it is evident that if the rays are not falling normally upon the cornea their intensity per unit area will decrease with the degree of obliquity. Actually, the energy varies quantitatively as the cosine of the angle of incidence of the beam, this angle being that which the incident ray makes with the normal to the tangential plane. The following table gives the factor by which the time of exposure determined for a normal ray should be multiplied in order to give an equivalent exposure with oblique rays:—

Angle of incidence.	Cosine.	Factor.
0 (i.e., normal)	.. 1.000	× 0.00
15 degrees	.. 0.966	× 1.03
30 "	.. 0.866	× 1.16
40 "	.. 0.766	× 1.30
45 "	.. 0.707	× 1.40
60 "	.. 0.500	× 2.00

Some hours after the administration of a small exposure to a normal cornea there is a pricking sensation as of a foreign body in the eye, a sensation which is frequently accompanied by the appearance of haloes, and which is followed by the symptoms characteristic of photophthalmia. After intense doses the pricking sensation gives way to pain, accompanied by marked photophobia, lacrymation, and blepharospasm. The appearance of haloes is due to corneal oedema; the pain is due to the irritation of the corneal nerve endings after the trauma to the epithelium. It follows that in those conditions where the epithelium has already been destroyed (as in the majority of ulcers) pain does not occur, provided the rays have been allowed to play on the ulcerated area only. The latent period which elapses before the reaction starts is about eight hours. In practice, therefore, when dealing with cases when a subsequent reaction is expected, it is well to conduct the treatment during the afternoon so that the symptoms begin to assert themselves during the night. If the



patient has the eye bandaged up so that the lids do not abrade the radiated area, he frequently experiences no subjective symptoms at all, especially if a small dose of aspirin or bromide be given before going to bed to ensure sleep.

#### *Clinical Indications.*

Corneal ulcers of practically every kind respond well to radiation with ultra-violet light, but, inasmuch as the more simple types of ulceration tend to heal up with the usual methods of treatment, it is in the more severe, the chronic, and the recurrent forms that the beneficial effect of treatment can be seen to the best advantage. In the more simple forms healing without any opacity is usually obtained; and the method has been found extremely useful in cases of foreign bodies in which infection has already become evident. With the more severe types of ulceration radiational treatment is the method of choice. In hypopyon ulcers, for example, a greater chance of recovery is offered than can be expected from cauterization, with, at the same time, less permanent damage to the cornea. In a series of 190 cases of this type of ulcer published recently by Hoffmann at Königsberg the percentage of excisions of the eye was reduced to 4.6 from the percentage of 32 which obtained before radiational treatment was introduced. Chronic ulcers, also, associated with a varying degree of deep keratitis and corneal opacity, and sometimes with iridocyclitis, in which the eye has reached a torpid and sluggish state, and which have progressed over long periods in spite of the usual treatment, may frequently be made to heal over and remain quiet after a course of three, four, or more exposures to light. The deep lesions of acne may also be very favourably influenced.

There are, however, two conditions wherein the beneficial effects of treatment are very evident: recurrent ulcers, and phlyctenular ulcers. With regard to the former, especially those marginal lesions associated with a continually relapsing conjunctivitis, the ulcer itself readily clears, an end which is, of course, usually easily brought about. But after the epithelium round the ulcer has been desquamated in the photophthalmic reaction following exposure to ultra-violet light, the new layer seems so healthy and resistant that it is enabled to withstand the liability to break down on future occasions. As a general rule the ulcer heals up after the first or second exposure, and in the milder cases heals up, leaving a transparent facet; but it is preferable in most of these cases to give a third or fourth exposure, bringing about a mild reaction each time, involving a traumatism and renewal of the epithelium in order to render the possibility of recurrences more remote.

Acute phlyctenular ulcers occurring in children respond so well to general light treatment and efficient dieting and hygiene that it is not worth while, as a rule, to coax a child affected with this disease to submit to keeping its eye open in the beam of the slit-lamp. It is in the chronic cases which have gone on for years, leaving an ulcerated, opaque, and vascularized cornea, and involving continued irritation, frequently with acute exacerbations, that the method has its greatest use. Here again it is best employed along with general light baths. In these cases the eye quiets down and becomes white and comfortable, but the extensive opacities, which are already present with the resulting diminution of vision, remain.

One word may be said with regard to corneal opacities. In order to investigate claims in the literature, a series of nine cases of old corneal opacities were given a fair trial with local radiation. No results justifying the continuation of the treatment were seen anywhere. It is certainly the case, however, that recent opacities, such as those following ulceration, may be improved, and the prophylactic action of the treatment of ulceration by light in the prevention of opacity formation is very marked. Two factors seem to enter into this: the rapidity of healing with new-formed epithelial cells, and the large amount of vascularization which the photophthalmic response excites. To this extent its action would seem to be comparable to that of an irritant, such as dionine.

### Coffee and Sterility.

(Abstracted from *The Medical Press*, September 25th, 1929, p. 249.)

SOME experiments made by Professor Stieve, of Halle, go to support the theory that female rabbits are more sensitive to caffeine than the males, and that caffeine has a toxic effect on the generative glands. In females dying from chronic caffeine poisoning, ovarian degeneration was observed, whereas in males the semen was no longer formed. The quantities of the drug which were used in these cases were much larger in relation to weight than are ever used in human therapy. Human beings, however, are much more sensitive than rabbits to caffeine, and a daily consumption of four or five large cups of strong coffee would be less than one-tenth of the poisonous dose for a rabbit. Professor Stieve is of opinion that regular consumption of strong coffee has a deleterious effect upon the generative capacity, and, indeed, that it may affect adversely the general health. In some measure to the inhibition of coffee he ascribes the sterility which has been observed among civilised communities. Mental strain is capable of diminishing the sexual impulse, and since mental workers are often accustomed to drink strong coffee, the cumulative effect may be productive of sterility.

### Decompression of the Kidneys and the "Overflow" Bladder.

By FRANK KIDD, M.Ch.

(Abstracted from *The Brit. Journ. Urolgy.*, September, 1929, Vol. I, No. 3, p. 305.)

THE victims of enlarged prostate fall into three clinical groups, there is the man with increased frequency of micturition, diminished stream and consciousness of difficulty in passing water. There is the man who in addition develops occasional attacks of painful retention of urine. Finally, there is the man who suffers from an "overflow" bladder. Patients in the first two groups are seldom suffering from chronic uræmia, and for that reason their lives are not likely to be endangered by the casual passing of a catheter, provided sepsis is guarded against. Patients in the last group come under an entirely different category. Suffering from chronic uræmia, they live on the edge of the precipice of renal failure. Uninstructed or hasty catheterisation may be fatal.

The man with the "overflow" bladder is not particularly worried about himself because he has no pain or difficulty in passing water. All that he complains of is that he passes water every hour or so both night and day, and in consequence is suffering from lack of sleep. Sometimes he wets his bed. He has lost weight, has lost his appetite, is easily nauseated and may vomit. He is usually extremely thirsty. He looks thin and wasted, and is anæmic and slightly puffy about the eyelids. His skin is dry and inelastic, and there is loss of subcutaneous fat. Contrary to the usual teaching, he has a moist, clean tongue. His urine is clear and free from pus, of low specific gravity, and contains a trace of albumen and a few casts. Abdominal examination reveals a large elastic swelling protruding from the symphysis to the umbilicus, a painless atonic bladder. By means of rectal examination it is a difficult matter to estimate the exact size of the prostate, as the pelvis is crowded out by the large cystic bladder.

On no account whatever should a catheter be passed to empty such a bladder or to carry out functional tests on the urine. There is no pain to call for the immediate passage of a catheter, so that before steps are taken to decompress the bladder and kidneys gradually, the patient should be put to bed and the serious nature of his complaint be explained to him and his friends. If a catheter is passed and the bladder emptied suddenly, hæmaturia usually occurs and death ensues from uræmia. Hasty interference with a catheter carries with it a far higher mortality rate than any kind of operative interference.



With regard to renal-function tests, there is only one that is advisable and one that will prove the gravity of the renal back pressure. The blood urea should be estimated. In mild cases it lies between 50 and 100 mg. per 100 c.c. of blood, but it often exceeds 300 mg., and yet the patient can be steered through an operation and be restored to a healthy life if the principle of renal decompression be observed.

The presence of a giant "overflow" bladder means that there is temporary loss of tone of the bladder muscle, and hence no bladder pain. It means that some of the raised pressure of the urine in the bladder is thrown back on to the kidneys. The effect of this pressure on the kidneys is to cause an intermittent dull pain in the back of one or both loins. The patient usually states that he has no pain, but when questioned will admit that he has suffered for some time from "lumbago."

This back pressure on the renal pelvis is of a moderate degree, averaging about 15 mm., and seldom exceeding 30 mm. of mercury. As Hinman, Morrison and Lee Brown have shown from experiments on animals, the kidneys should be considered as a vascular sponge. Even the mildest rise of pressure in the pelvis of the kidney causes a stretching and narrowing of all the renal arteries and capillaries, with engorgement of the veins. Sudden release of this raised pressure allows blood to re-enter the arteries so rapidly that the capillaries burst and blood is extravasated into the substance of the kidney. The renal secreting tissues, already handicapped by ischemia caused by the back pressure, cannot withstand this further sudden strain and acute uræmia ensues. Clinically, if the bladder is emptied suddenly blood escapes from the ruptured capillaries into the renal tubules and hæmaturia is seen. If this hæmaturia is seen the patient seldom recovers.

A great surgical principle therefore emerges from these considerations. *In cases of overflow bladder the kidneys must be decompressed gradually.* One well-recognized method that has been in use for many years is to pass a catheter of small calibre fitted with a bung, the bung being in place before the catheter is inserted. The catheter is tied in position, measured amounts of urine are then drawn off every hour or every two hours by removing the bung. As these patients are usually making 100 ounces of urine in twenty-four hours, 5 ounces of urine should be withdrawn every hour, or 10 ounces every two hours. In this way the bladder will be emptied in the course of five days.

There are many objections to this procedure. Either too much urine may be drawn off at a time, or the bung may slip out and the bladder be emptied completely. Even if these dangers are avoided, urethritis, epididymitis, cystitis and pyelitis may occur and add to the dangers of an already dangerous situation. Finally hæmorrhage is likely to occur and the catheter become blocked by clots so that further emptying of the bladder may be rendered impossible.

Other methods that have been in use are to puncture the bladder by trocar and cannula, or to open the bladder, empty it completely and put in a tube. Both these methods transgress the principle of gradual decompression of the kidneys, and they should be condemned.

The writer's practice is to insert a "Malecot" rubber tube suprapubically into the bladder by a method he has devised, whereby not a drop of urine is lost while the tube is being inserted, and then to put the bladder on a balance immediately after the operation so as to decompress the kidneys slowly. The method has been made possible by devising a new type of instrument, namely, a tube knife.

A small incision is made rather high up above the pubes, the recti divided and the distended bladder exposed to the sight of the eye. The knife attached to the end of the obturator is made to pierce the tip of the tube. The tube is then stretched on to the obturator and the knife and tube plunged into the bladder at a point where no distended veins are seen. The catch of the obturator is thrown over by the thumb, the mushroom of the tube expands and the obturator is removed. The

tube is pinched between the thumb and first finger of the left hand and a large bung inserted into its mouth. It will now be found that the tube is in the bladder, that there is no leakage round the tube, and that not a drop of urine has escaped from the bladder. The wound is stitched up, dressings and a binder are applied, and the patient is returned to bed.

A table is placed at the side of the bed with some large books or an empty drawer on the top of the table, and a mackintosh on top of these. On the stand thus formed is placed a large slop-pail. A special "U"-shaped metal tube with an opening at the top of the "U" to prevent syphonage is attached to a piece of rubber tubing, at the end of which is a glass connection of such a size that it fits the "Malecot" tube. The bung is removed from the tube, the tube being pinched, and the glass connection is inserted into it. The metal "U"-shaped balance tube is now held up and caught over the edge of the slop-pail. The slop-pail is held at a height of about one and a half feet above the level of the patient's abdomen. At this height it will usually be found that no urine flows over into the slop-pail. The pail is gradually lowered until a little urine flows over into the pail. This gives the height of the pressure of the water in the bladder. The pail is raised some six inches higher than this and arranged on the stand by the side of the bed. A long piece of string is tied round the "U" tube and nailed to the wall as an additional security. It will now be found that during the next few hours every time the patient coughs or takes a deep breath a small amount of urine flows over into the pail. In this way the pressure of the urine in the bladder and kidneys is put on a balance without the need for any elaborate apparatus. The nurse is instructed on no account to lower the pail, as the patient's life depends upon keeping it at the proper height. In the course of three or four days the bladder gradually empties itself without hæmaturia, and after five days the pail and balance can be removed and the urine be allowed to drain away from the "Malecot" tube into a bottle suspended from the side of the bed in the ordinary manner. Whenever it is necessary to disturb the patient for purposes of nursing, the tube can be disconnected for a few minutes and blocked with a bung, and at the end of the manipulations the balance can be refixed without difficulty or danger.

This method is a distinct advance in the surgery of the bladder. It is the only simple method the writer has been able to devise by which it is possible to insert a suprapubic tube into the bladder without losing a drop of urine and to put the kidneys on a balance without any elaborate apparatus. He has carried out this operation on quite a number of patients with a blood urea of over 300 mg. per 100 c.c. of blood and they have done well. When the blood urea comes down to normal, indigo tests are carried out. When these prove satisfactory the prostate is removed at a second operation.

This is a method that can be widely practised, as only two special instruments are required. There is always time to put these patients to bed and carry out the operation without hurry and at a convenient time. They are not cases that have to be dealt with by passing a catheter in the consulting room as if it were a matter of life and death to empty the giant bladder. The patient having no pain can be persuaded to wait until proper arrangements have been made for gradual decompression of his bladder and kidneys.

## Reviews.

**STONE AND CALCULOUS DISEASE OF THE URINARY ORGANS.**—By J. Swift Joly, M.D. (Dub.), F.R.C.S. (Eng.), 1929. London: William Heinemann (Medical Books) Ltd. Pp. 568 plus XVIII with 189 illustrations and four coloured plates. Price, 45s. net.

It is stated in the preface that no English book on stone has been published during the last twenty years.

An authoritative work dealing with this subject separately is certainly very welcome, especially in India where the disease is so common. As to the arrangement of the subject, the author states that this has been kept as simple as possible. "After a brief historical sketch and a chapter on the formation and general aetiology of stone, I have followed the anatomical order, separate chapters being devoted to stone in the kidney, ureter, bladder, etc. This classification is not perfect, but on the whole I feel it to be the most satisfactory."

Chapter I deals with the historical side of the subject. The history of stone dates back to the dawn of civilization. The earliest specimen of vesical calculus is said to be that described by Professor Elliot Smith, which is computed to be about 7,000 years old! The history of stone is described, as far as it is known, in ancient Egypt, India, Greece, Rome, the Dark Ages, during Arabic ascendancy, and so on up to modern times. It makes a story of the greatest interest to every surgeon. We learn that the suprapubic operation for stone was first performed by John Douglas in England about the year 1720, while it is described in the Ayurveda as being performed in India about the beginning of the Christian Era—that is to say, about 1,500 years earlier. Innumerable quack remedies were prescribed for dissolving stone. An early Hindu remedy included a mixture of butter, pepper and ginger, to which is added, drop by drop, the urine of a sheep. The famous Arab physician Avicenna "recommended laurel, cypress, the oil or ashes of scorpions, egg-shells, melon seeds, etc., for the purpose." The first lithotripsy instrument was introduced by Civiale in 1818, and numerous improvements followed designed by Heurteloup, Thompson, Bigelow, and Freyer. The first practical instrument for evacuating the fragments was invented by Clover in London, and Bigelow followed up the same idea, and introduced the modern evacuator, which made the operation of litholapaxy possible. In India, surgeons rapidly developed the operation, especially Keegan and Freyer, and the former first used small instruments suitable for children. The author observes that "there is no doubt that it is the operation of choice for uncomplicated vesical calculus," and this should be noted as there is a great tendency to-day to regard suprapubic lithotomy as a better operation. At St. Peter's Hospital from 1864—1873 the mortality after lithotripsy was 15.25 per cent., and the average stay in hospital about 100 days. In the decade 1915—1924 the mortality after litholapaxy was 2.2 per cent., and the average stay in hospital about 5 days.

The formation and composition of calculi are discussed in Chapter II. A calculus is defined as a "concretion formed of urinary crystals bound together by a colloid substance." A very full and interesting account of the biochemistry and incidence of stone in man and animals is given under the following headings: Part I—the composition and formation of calculi; Part II—the general characteristics of calculi; Part III—the aetiology of stone, general and personal.

Chapter III deals with renal calculus. A number of excellent illustrations of the condition are reproduced, and the aetiology, the characters of the stone itself, the pathology, symptoms, methods of examination—including over twenty pages on radiographic methods—diagnosis, course and termination, and treatment, are fully discussed in the space of 174 pages. This chapter contains a mass of information which it is not possible to go into in any detail, but one can state with confidence that there are few surgeons in active practice who will not add considerably to their knowledge of the subject by a perusal of its pages.

Ureteric calculi are discussed in Chapter IV; these are stones which are permanently or temporarily impacted in the ureter. The great majority come down from the kidney and there is a history of renal pain, but a calculus may form in the ureter round a foreign body or above a stricture. It is a disease of middle life and is commoner in males. When aseptic the stone is composed of calcium oxalate, when infected it is phosphatic. The changes in the ureter and kidneys are described; the

symptoms caused by ureteric stone; methods of examination; differential diagnosis; course and evolution; and treatment. Two important points are to be remembered, namely, that every ureteric stone tends sooner or later to destroy kidney function; and, that medical treatment should be given up if the stone has not moved down to an appreciable extent in a month or six weeks, other treatment becoming necessary. If left unrelieved the further danger arises of the infection, if present, involving the other kidney.

The important subject of "calculous anuria" is discussed in Chapter V. This term is defined as "a sudden cessation of the excretion of urine, caused by the presence of one or more stones retained in the upper portions of the urinary tract." Four groups are considered; obstruction of both kidneys or ureters; obstruction of the only functioning kidney; obstruction of one kidney, its fellow being diseased; obstruction of one kidney, its fellow being apparently healthy. The state of the obstructed and of the opposite kidney, and the theory of reflex anuria are gone into; it is stated that probably all the phenomena of calculous anuria are explicable on the assumption that they are the result of changes in the blood and urinary pressures, without the necessity of considering any nervous mechanism. The signs and symptoms of this condition are considered as follows: prodromal symptoms, onset, clinical course, duration and termination. The mortality is very high, about 70 per cent., the patients dying between the 5th and 12th days. As regards examination and diagnosis, the most important points are the existence of anuria, its cause, and the kidney last obstructed. Treatment is either by catheterisation of the ureters, or by operative treatment; failing relief by catheterisation, drainage of the kidney becomes imperative. Late results depend upon two factors, the functional value of the kidney and the presence or absence of infection.

Chapter VI deals with vesical calculus, a subject of great interest to surgeons in India—the aetiology, characters of vesical stone, symptoms, methods of examination, differential diagnosis, and treatment. The enormous incidence of vesical stone in India and in some other tropical countries is ascribed to the frequency of stone in childhood; this is partly due to the poor quality of the food, and particularly to the deficiency of fat-soluble vitamin. An unhelped for improvement in this respect has followed the better feeding and hygiene of children in many parts of Europe. The largest vesical calculus referred to is one described by Pithas, which weighed 5 lb. 10 oz., and another by Randall weighing 4 lb. Over 90 pages are occupied in relating the story of stone in the bladder, and illustrated by photographs, radiograms, and very beautiful coloured drawings of cystoscopic appearances. As regards treatment, this is definitely surgical as no method has yet been discovered by which a stone can be dissolved *in situ*. It is definitely laid down that "every uncomplicated stone that is not too large to be grasped by the jaws of the lithotrite ought to be crushed." The indications and contra-indications are given. The author thinks that the type of lithotrite used by Freyer in India is the best on the market—Thompson's blades and a Bigelow handle. It will comfort those who have not had much experience of this operation to know that "injury to the bladder wall is a rare complication"; and this accident would never occur "if the surgeon would realize that the lithotrite should be kept steady in the middle line of the bladder, with its beak pointing upwards."

The last two chapters in the book, Chapters VII and VIII, deal with prostatic calculi and urethral calculus. Space forbids any further reference to these chapters. It will surprise some to know that a urethral stone may weigh as much as 24 lbs.

We venture to congratulate the author and the publishers on the production of this fine volume. It will be read with interest by every surgeon, as it provides an authoritative and up-to-date account of an important subject, and supplies at the end of each chapter a fully adequate list of references.

**THE HISTORY AND TRADITIONS OF THE MOORFIELDS EYE HOSPITAL.**—By E. T. Collins. London: H. K. Lewis and Co. Ltd. 1929. Pp. XII plus 226 with 27 plates. Price, 12s. 6d. net.

THIS is a most interesting book and deals with one hundred years' of ophthalmic discovery and development. Its primary aim is to put on record the traditions of the Moorfields' Eye Hospital for the benefit of past, present and future workers within its walls, but as so many giants in the art of ophthalmology have been attached to this institution the book will be of great interest to the world in general. It is due to Dr. J. C. Saunders that "The London Dispensary of Curing Diseases of the Eye and Ear" was opened in March 25th, 1805. In January 1808, the name was changed to that of the London Infirmary for Curing Diseases of the Eye. After nine years it became obvious that larger and more commodious premises were necessary, and in May 1821 the foundation stone of the London Ophthalmic Infirmary was laid in Moorfields. Dr. William Lawrence and Dr. Frederick Tyrrell were the Surgeons to the Infirmary.

In April 1836 the name of the Institution was changed to "The Royal London Ophthalmic Hospital, Moorfields" when the Duchess of Kent and Princess Victoria became Patronesses. It will be of interest to ophthalmic surgeons working in India where quackery is still rampant that in the eighteenth century ophthalmology was the province of a set of ambulant practitioners who toured the country accompanied by all the apparatus of shameless advertisement, couching cataracts and selling infallible salves and remedies.

It was with such prating mountebanks that Saunders ran the risk of being confused when he devoted himself specially to the treatment of eye disease. Benjamin Travers succeeded Saunders, who was demonstrator of anatomy at Guy's Hospital and Surgeon to the East India Company. In 1819 the Honourable Directors of the East India Company became impressed by the great prevalence of eye diseases in India, and applied to Travers in the matter. He advised establishing eye institutions in India. The advice was accepted and Mr. R. Richardson, one of the Company's Surgeons who had studied ophthalmology under Travers, was sent to Madras where he founded "The Madras Eye Infirmary." So successful was the work of the institution that in 1824 two other surgeons who had studied at the London Eye Infirmary were sent out to India. Mr. C. J. Egerton went to Calcutta and Mr. Jeafferson to Bombay, where each founded an Eye Hospital.

In 1814 Travers found that his work was too arduous and William Lawrence was appointed to the staff. He later became Sir William Lawrence, Bart., F.R.S., and the greatest ophthalmic surgeon of his time, as well as being a leading general surgeon. Tyrrell and Scott were the next ophthalmic surgeons appointed to the staff. The former's memory is enshrined by a blunt hook which he introduced for the operation of making an artificial pupil which is still known as "Tyrrell's hook." The latter is best remembered in general surgery in connection with his treatment of joints and chronic ulcers of the leg: "Scott's dressing" and "Scott's ointment" are still well known. It is said of him that no man lost vitreous humour more frequently during cataract operations, at which he was invariably annoyed, ascribing it to "fluidity" of that body.

Critchett and Bowman joined the staff of the Hospital as Assistant Surgeons in 1843 and 1846 respectively, and afterwards were to make such advances in the science of ophthalmology. Bowman was the first surgeon to use chloroform in cataract extraction, which was the general custom up to the time of the introduction of cocaine in 1884. With the introduction of anaesthesia many new operative procedures on the eye were invented. Excision of the eyeball was at one time a formidable operation and only resorted to in the case of malignant growths. The operation of removal of the eyeball out of its capsule originated with an Irish anatomist, O'Ferrall, and Bonnet in France was first to put it into practice in 1842. In 1851 Von Graefe, Donders and

Bowman, who were destined to revolutionize the practice of ophthalmology, came together in London and started an intimate friendship which lasted for the rest of their lives. Iridectomy for glaucoma according to Von Graefe's method was first done at Moorfields in 1857. The ophthalmoscope was invented by Von Helmholtz, an army surgeon, in 1857.

In 1857 Streathfield joined the staff of the Hospital and is remembered to this day by the lid operation called after his name. In the same year the first clinical assistants were appointed and included amongst others Jonathan Hutchinson. The first English journal devoted specially to ophthalmology originated with the medical staff of Moorfields Hospital and was called *The Ophthalmic Hospital Reports*. It first appeared in October 1857.

Jonathan Hutchinson was appointed to the staff in 1862. He was described as "the greatest general practitioner in Europe" and also as the "universal specialist."

Waren Tay joined the staff in 1877 and Nettleship in 1882, both of whom had worked as clinical assistants to Jonathan Hutchinson. With the advent of Lister's great discovery of germs being the cause of putrefaction in wounds, ophthalmic surgery took on a new phase. Couper who joined the staff of the Hospital in 1866 was one of the first and most ardent disciples of the Listerian doctrine.

Pasteur's researches in fermentation and putrefaction led to the discovery of the various types of bacteria, and in 1884 incubators and bacteriological apparatus were installed in the pathological laboratory at Moorfields. Lawford who was curator of the museum at Moorfields was one of the first to detect Koch's bacillus in the tissues of the eye.

In 1884 cocaine was first used in England and the first operation performed under its influence was a tattooing of the cornea by Marcus Gunn.

With new ideas which arose out of Florence Nightingale's teaching and with the outcome of bacteriological investigations, the general principles of hospital management became completely changed, and it became obvious in 1884 that the original Moorfields Hospital could not be converted into an up-to-date institution. But it was not till 1897 that the foundation stone of the present Hospital in the City Road was laid and in 1899 it was opened for the reception of patients.

Other distinguished ophthalmologists of more recent date who were on the staff and whose names go down to posterity were Tweedy, Nettleship, Marcus Gunn, Stanford Morton, Treacher Collins, Holmes Spicer and Worth.

The perusal of this book will certainly prove that Moorfields Eye Hospital has justified its existence, and to the able members of its staff who have been largely responsible in the great developments of the science of ophthalmology the world in general owes a deep debt of gratitude. The book is entertaining and instructive, and we cordially recommend it to those interested in ophthalmology.

E. O'G. K.

**"DEVILS, DRUGS, AND DOCTORS": THE STORY OF THE SCIENCE OF HEALING FROM MEDICINE-MAN-TO-DOCTOR.**—By H. W. Haggard, M.D. London: W. Heinemann (Medical Books), Ltd. 1929. Pp. XXII plus 405, with 131 illustrations and 15 plates. Price, 21s. net.

THIS, "the story of the science of healing from medicine-man to doctor," from the pen of the Associate Professor of Applied Physiology, Yale University, is a general account for the layman, unburdened with technical quotations that might have made many points clearer to the profession. The result is almost light reading, but of attention-gripping interest.

The book opens with four chapters on obstetrics from the earliest times up to the recognition of the cause though not the organism of puerperal fever. The impression left with us is one of wonder that between the time when human parturition, as in primitive races even yet, was attended with little more danger than

among the other mammals, and the development in the last century only of modern methods of midwifery, the then population of Europe did not completely cease to exist. Nothing could more lucidly express the state of affairs than the description, and illustration, of "baptismal syringe" of the Seventeenth Century, for use in the case of an unusual presentation, prior to the discovery of even "podalic" version. There follows an account of the discovery of anæsthetics which is so much weighted towards its obstetrical aspects, that it might well have been included in Part I.

Part III deals with the "progress of surgery," and deals in two chapters with the growth of anatomical knowledge, the primary essential surgery engendered by the continual state of warfare of the Middle Ages, through the growth of the nursing profession up to Lister's surgical application of Pasteur's discoveries.

Part IV deals with the great epidemic diseases, plague, cholera, smallpox, and syphilis. In connection with the latter, most interesting historical records are given of its spread through Europe, assuming, though with some reservation, its New World origin. True to the American School, the author apparently holds with "treponism," and suggests that the syphilis of the Old World is the yaws of the New, or a strain thereof of enhanced virulence. A most interesting quotation from Asturc, physician to Louis XIV, shows how, following Varro, others speculated on the micro-organismal nature of this and many other diseases in pre-Pasteurian times.

Part V deals with the "healing art" from the days when it was literally an art, up to the pioneers of modern medicine in the last century. We are taken through the various aspects of faith healing and osteopathy, and in the case of the reviewer at least, for the first time obtain a clear idea of the origin and tenets of such cults as Christian Science. The author next deals with drugs and prescriptions, with a wealth of illuminating illustrations, and passes to the inevitable reaction against the enormous and useless pharmacopœia and posology of the Eighteenth Century and earlier as expressed by homeopathy. Here he appears, and perhaps rightly, somewhat sympathetic, for, as he points out, even to-day, or rather prior to the first synthetics and endocrine extracts, what was there in the armamentarium of even the seniors still in practice, other than quinine and mercury, that was in any sense a specific. We finally end with a brief chapter on the place of medicine in modern civilization, in which we hear, for the first time, and all too briefly, of Morgagni, the first real pathologist, whom the reviewer had only heard of previously through failing, anywhere in this country, to obtain a reference in a journal bearing this great man's name as its title. One could wish that details of Morgagni and his work had been given in Section III, at the end of the "Anatomy."

The illustrations throughout the book are reproductions of mediæval woodcuts and paintings, caricatures by Hogarth, and the like. If it is stated that (p. 244) pictures of "Bloody" Mary of England show clearly the stigmata of congenital syphilis, one wonders what type of neurotoxis is indicated by the photo of Mrs. Mary Baker G. Eddy opposite p. 318. It would be interesting to have had the diagnosis of her countryman Harrower on the particular endocrine deficiencies that are indicated by the portrait!

A few minor points call for criticism. The "root" of an orchid that in shape resembles a testicle is not a root at all, but a pseudo-bulb on the stem (p. 352); whilst on p. 368 the description of acid-fast and Gram-positive bacilli could have been made much clearer without more than a few extra sentences. With one point, above all, that is insistent throughout the book, we are in the fullest agreement. The future lies with preventive rather than with curative medicine. To all medical men interested in the dark beginnings of their profession, and in the few great names that dragged it within living memory from the slough of 2,000 years, we recommend this book.

R. S. W.

**THE EXTRA PHARMACOPŒIA OF MARTINDALE AND WESTCOTT. VOL. II. 19TH EDITION.**  
Revised by W. H. Martindale, Ph.D., F.C.S.  
London: H. K. Lewis & Co. Pp. 759 plus XXXVIII. Price, 22s. 6d.

THIS very well known and extremely important volume must be the constant companion of very many of our readers. The amount of information compressed within its relatively small compass is amazing; it contains in general supplementary information in *materia medica* to Vol. I, microscopical, chemical, and biochemical methods of diagnosis, analysis and assay, and is a volume of extreme value to medical practitioners, pharmacists, analysts, and others. In his preface to the present edition Dr. Martindale complains of the overwhelming bulk and character of the medico-scientific literature of to-day, and in some instances he prefers more established and tried older methods than more recent and dubious ones. Nevertheless, the book has undergone ruthless pruning in order to keep down its compass, whilst large sections of new matter have been added. The volume, in brief remains what it always was, one absolutely essential to the physician and laboratory worker, for nowhere else will he find so much information in so small a compass. Yet we would entirely agree with Dr. Martindale's criticism of present-day medico-scientific literature; there is far too much of it. A research worker who publishes twelve papers a year should be penalised; quality and not quantity of research output is what is wanted, whilst a stringent censorship of medical journals is badly wanted in this respect.

The nineteenth edition of this well known work reflects the very great strides which have been made in chemical, pharmaceutical, and medical research during the four years since the previous edition. Yet, "we are inclined to think that many new remedies—including those with vast apparent success—are advocated (to-day) without sufficient proof of utility" writes Dr. Martindale. "We are, of course, by no means averse to pharmacological deductions; indeed, the volume under consideration is largely concerned with experimental research in many fields."

Turning to the many new features of the present edition, these are so numerous that we have not the space in which to deal with them, but the more striking deserve notice. The new methods for the biological testing of toxicity of the organic arsenical derivatives, as adopted by the Medical Research Council and the League of Nations Commission, are fully detailed. The recent work on the toxicity of carbon tetrachloride is reviewed, and it is noted that many workers have gone back to the use of thymol in ankylostomiasis. A review of the value of different methods for the assay of digitalis is included. B. P. liquid extract of ergot is almost valueless. Iodine deficiency is a subject on which much new information is included; recent work in New Zealand shows that iodine deficiency is almost certainly the most important factor in the production of goitre. A simple procedure for iodine estimation, which involves the use of only five chemical reagents, is given. Chlorination of water supplies does not appreciably interfere with their iodine content, but on the other hand white flour contains fifteen times less iodine than the germ of wheat.

The use of iodinol, 40 per cent., for x-ray work in connection with diseases of the bronchi and urethra is outlined. Emetine poisoning is noted, and an assay process given for mercurochrome. Recent work upon the whole group of the vitamins—A, B, C, D, and E—is the subject of ten pages of closely printed matter, followed by a general section on foodstuffs. Liver function tests, mannitol-quinine for injection, and the biological assay of strophanthus are further subjects dealt with.

Animal organotherapy naturally figures largely in the book; also the methods for recognition of organic chemicals, and the tests for the antiseptic power of different substances. Radiology is dealt with under the headings of dosage, ultra-violet light, diagnosis, treatment, dangerous effects, protective materials, high frequency current, diathermy, Finsen light, heliotherapy, etc. Radium is the

subject of a further section; and the author regards the present monopoly with regard to radium as "scandalous and from all aspects to be regretted."

The chapters on the analysis of urine, blood, faeces, and cerebro-spinal fluid have been drastically revised and largely re-written. The subject of milk is exhaustively dealt with; all recent legislation in Great Britain from 1915 to the present date is reviewed, and an immense amount of public health and laboratory information is here included. In the bacteriological notes almost every disease from acne to yellow fever has been dealt with, recent vaccination orders being outlined, and the latest work on smallpox and yellow fever.

A general inspection of this volume leaves one with an impression of the present-day enormous scope, but also confusion, of therapeutic methods in general. The future, we consider, must tend towards more standardization and less "random sampling."

We need add nothing further about this invaluable work, except to say that in its new and latest edition it is as important and valuable a *vade mecum* to a host of workers of different kinds as it ever was, and even better than before.

R. K.

**BAILLIÈRE'S SYNTHETIC ANATOMY. PART V. THE LEG. PART VI. THE FOOT.**—By J. E. Cheesman. London: Baillière, Tindall and Cox. 1929. Pp. 6 in each part, with 12 plates. Price, 3s. net per part.

We would like to draw the attention of medical students and of surgeons to Parts V (the leg) and VI (the foot) of this very fine work. It is beautifully executed and of the utmost helpfulness. The work consists of a series of drawings in colour on transparent sheets of paper superimposed on one another. By turning over the leaves the student obtains a reconstruction of the parts as they are dissected. The execution of the plates by the author, Dr. J. E. Cheesman, is altogether admirable.

In these two sections the anterior tibial and peroneal arterial systems of the leg are very well brought out, with the branches of these vessels and the medial and lateral plantar arteries of the foot. As in the previously published sections, the text matter is well indexed and this greatly facilitates reference. We can cordially recommend this fine work alike to medical students and surgeons. We have noted a tendency of the pages to stick together in the hot and moist climate of Calcutta, and possibly the publishers can pay attention to this point with regard to copies intended for sale in the tropics.

N. C.

**PHYSIOLOGY OF THE CENTRAL NERVOUS SYSTEM AND SPECIAL SENSES.**—By Dr. Vazifdar, L.M. & S., F.C.S., F.C.P.S. Fifth Edition. Calcutta: Thacker, Spink and Co. 1929. Pp. 301 plus VII, with 30 illustrations. Price, Rs. 5-4 net.

*Physiology of the Central Nervous System and Special Senses* by Dr. Vazifdar has already attained some degree of popularity, and the appearance of its fifth edition will be welcomed. Though much new material has been incorporated, the author has not attempted to cover the whole field of the physiology of the central nervous system and indeed that would have been impossible in such a small book, but has restricted his attention to the special requirements of medical students. The book is a résumé of the subject treated in exhaustive textbooks and the author cordially admits in the preface that it is meant to be used as an adjunct to other textbooks. Nevertheless in the book there are original touches which enhance its value. The tables are admirably arranged and give a wealth of information in a nutshell. The diagrams are all executed in line-drawing, are very clear, and are quite easy to reproduce and to remember. The discussions on applied physiology in small print in almost every chapter of the book will appeal to students and physicians alike, inasmuch as these will help them to the clear and scientific understanding of the various nervous diseases. The consideration of the autonomic nervous system does not fall within the

province of the book, but this is so intimately connected with the central nervous system in the minds of the readers that a chapter devoted to the autonomic system would certainly have been appreciated.

On the whole the book is admirable and is very well adapted to the needs of medical students and practitioners for ready reference and guidance.

R. N. C.

**FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE.**—Transactions of the Seventh Congress, British India, 1927. Vol. II. Published by Thacker's Press & Directories, Ltd., Calcutta. Edited by Lieut.-Col. J. Cunningham, C.I.E., I.M.S. Pp. XVI plus 871, with numerous plates and figures in the text.

We have previously dealt so fully with the Seventh Congress of the Far Eastern Association of Tropical Medicine, held in Calcutta in December 1927, that our note with regard to its *Transactions* must necessarily be brief. The three volumes, when completed, will be an immense addition to the literature on tropical medicine, for there is hardly any field of tropical medicine and hygiene with which the Congress did not deal. The second volume is a quarto volume of 871 pages, admirably illustrated and edited, and very well got up and published. It contains the papers and discussions with reference to plague, cholera, dysentery, sprue and intestinal infections, bacteriophage, leprosy, tuberculosis, bacteriology, typhus-like diseases of the tropics, protozoology, and—above all—malaria. There is here a wealth of information for the student of tropical medicine and hygiene.

Of pre-eminently important papers in this volume one would single out Colonel Mackie's address on the present position of the world-plague problem; Khan Bahadur Dr. N. H. Choksy's paper on an unrecognised type of plague (one associated with extensive necrosis of the subcutaneous tissues); Colonel Russell's studies in the epidemiology of cholera—a summary of many years of investigation and analysis of statistics; Colonel Dunn's account of the successful anti-cholera measures at Hardwar; the reports on the investigation of sprue from the Haffkine Institute, Bombay; Dr. d'Herelle's studies of bacteriophage; Dr. Muir's survey of leprosy in the tropics—a series of several papers dealing with different aspects of the leprosy problem; the papers on tropical skin diseases from Colonel Acton's department; and, above and beyond all, the section on malaria.

Very important are the resolutions passed with regard to the control of plague and malaria. Both lay down a programme for future study and research. Members who were present at the discussions in the malaria section will remember that there was a considerable difference of opinion between those who advocated malaria control by extensive quinine distribution and mosquito-swatting, and those who held that the only way to control malaria was by anti-mosquito, anti-larval, and even anti-species measures. This discussion is here given in full, and is of very great importance.

The *Transactions* will be issued to members of the Association as they are published. Whether other copies will be available for purchase, we do not know; but there is no large medical library in India which should be without a set. In the course of time the work summarised in this wonderful volume will be incorporated in textbooks of tropical medicine; in the meantime the medical man working in the tropics would do well to secure a copy of the *Transactions*, and read or glance through it, for they contain a wealth of new information with regard to tropical diseases.

R. K.

**THE LAW RELATING TO MEDICAL, DENTAL, AND VETERINARY PRACTICE.**—By Fred Bullock, LL.D., Barrister-at-Law. Pp. 317. London: Baillière, Tindall and Cox. 1929. Price, 12s. 6d.

THIS is a most important book, very well got up and published, and issued at a very reasonable price. The present laws in Great Britain relating to medical practice are the outcome of four centuries of experimental legislation, and are the models upon which most



medical legislation in the British Empire has been founded. Further, the book has been revised by Colonel Norman C. King, Registrar of the General Medical Council, and by Dr. Alfred Cox, Medical Secretary to the British Medical Association. It is therefore fully authoritative.

After an introductory chapter, the author first deals with the subject in historical sequence, showing how physicians and surgeons came to replace the old time barber-surgeons, and veterinary surgeons the farriers and marshals of olden days. There is very much of interest in this section, including an account of the granting of charters to different London corporations. Next comes an account of the early statutes, dating back to the first Medical Registration Act in 1511. The Lambeth degrees were authorised in 1533, and the first Barber-Surgeons' Company was incorporated in 1540. King Henry VIII unfortunately, amongst his other irregularities of conduct, commenced the granting of special licenses to practise to quacks, and even the ever famous Dr. Caius was unable to prevent an incompetent Franciscan friar from being elected an F.R.C.P. in 1563.

Chapter IV deals with the seventeenth and eighteenth centuries. One of the most important medical enactments was the Surgeons' Charter of James I, in 1605. Harvey's appointment as Physician to the King led in 1618 to a new charter issued to the College of Physicians. The Apothecaries Society had become a trading company by 1684, and called down the caustic comments of Pope on them in 1711; patent medicines were already on the market by 1711.

Coming to the nineteenth century the Apothecaries Act of 1815 marks the first departure in modern legislation. They really aimed at protecting the public from unqualified persons; and a certified apothecary could practise anywhere in Great Britain. The British Medical Association was founded in 1832, and was mainly responsible for the preparation of the Medical Reform Bills. The Medical Act of 1858 set up the General Medical Council and laid the broad foundations of the present-day position. The effects of this Act are fully discussed by the author in a most important section of his book. The Medical Act of 1886 amended certain sections, whilst in 1927 the Irish Medical Practitioners' Act established a separate register for the Irish Free State.

Chapter VI deals with the history of legislation with regard to dentistry. Here the Act of 1878 is the fundamental one, modified by the later Dental Act of 1921. How badly this was wanted is indicated by the fact that it was estimated that at that time about 10,000 unqualified persons were engaged in the practice of dentistry. Chapter VII deals with the veterinary surgeon. Here the history of the subject centres round the "one port-of entry" question, and the fundamental Act is that of 1881, later modified by the Acts of 1900 and 1920. In 1923 the present charter was granted to the Royal College of Veterinary Surgeons.

The author next passes to a consideration of the present-day condition of affairs, dealing first with the jurisdiction of the Privy Council. Next comes a most important chapter on professional discipline; here one after another of a series of important and historical cases are cited and explained in their legal bearings. Chapter X deals with unqualified practice. Again the subject is illustrated by many cases quoted and quotations of legal decisions given. Chapter XI deals with the legal rights of qualified practitioners; these concern chiefly the legal right to sue for fees. Chapter XII deals with the legal offence of "professional negligence," and the concluding portion of the book is devoted to the law with relation to lunacy, an appendix quoting certain important sections of the Lunacy Act, 1890, verbatim. A bibliography, a table of the statutes, another of the charters and ordinances, and a third of celebrated and important cases referred to complete the volume.

This book has been badly wanted. It summarises the whole position, commencing with its historical foundation, and leading up to a full description of the present-day position, in a nutshell. It is commendably brief and commendably well written. It is both of historical

interest and present-day legal importance, and we would heartily commend it alike to medical librarians, those interested in medico-legal work, and barristers. Further, with medical constitutions at the moment very much under consideration in India, it has a special importance for India.

R. K.

**CATALOGUE OF LEWIS' MEDICAL AND SCIENTIFIC CIRCULATING LIBRARY.** Revised to the end of 1927. London: H. K. Lewis & Co. 1928. Pp. 576. Price, 15s. (to subscribers 7s. 6d.).

Lewis' medical circulating library is to the medical public what Mudie's is to the novel reading one. Founded in 1848, it has been continuously increased and added to since, and now includes all works of any importance, English, American, and foreign (if translated into English) in medicine and allied sciences generally. Individuals, medical societies, research departments, etc., may all subscribe. The terms vary from £1-1-0 per annum for one volume borrowed at a time, to £15 for thirty volumes; subscribers abroad are also required to pay a deposit of not less than half the annual subscription (minimum £1), and an advance of 10s. for postage. Volumes may be retained as long as desired, or exchanged as frequently as desired.

Medical men in India often find special difficulty in securing books to which they wish to refer, and there may be many of our readers who will be interested in this extremely comprehensive catalogue. It will also be of special interest to Indian medical men who are proceeding to Great Britain to take out post-graduate courses of instruction and diplomas.

The address of the firm is H. K. Lewis & Co., 136, Gower Street, London, W.C. 1, and envelopes should be marked "Library."

R. K.

**HABITUAL CONSTIPATION AND ITS TREATMENT.**—By Dr. M. H. Burnier, M.D. (Lausanne), M.R.C.S. (Eng.), L.R.C.P. (Lond.). Authorized translation by H. Child, M.R.C.S. (Eng.). Pp. 71, with 6 illustrations. London: Baillière, Tindall and Cox, 1929. Price, 3s. 6d.

THIS is an English translation of what is practically an essay, and perhaps its most interesting section is its preface, where the author outlines the usual course of the all too frequent case of habitual constipation; this may end either in the impossibility of emptying the colon without the daily use of a drastic purgative, or an operation for "kinks"; it may cost the patient half a fortune in skiagrams, gastric analyses, and the psychical treatment of "functional derangements."

In the first three chapters the author discusses the pathogenesis and evolution of constipation. Very important here is the discussion on the rôle of purgatives; if irritant they end by abolishing the normal "rectal call" to defæcate and make the patient almost entirely dependent on them. Enemata are better, and are the usual remedy adopted by the sedentary and middle aged, —or alternatively, suppositories. The author, however, believes that direct stimulus to the rectum is the best means of securing a normal evacuation and to this end has designed a special instrument—a "laxor." This is roughly an enlarged pair of forceps with the blades at right angles to the handles: the vaselined blades are inserted into the rectum, and alternately opened and closed by manipulation of the handles, thus stimulating the "rectal call." An account of seven illustrative cases completes the brochure.

Theoretically, we suppose that the author must be right in claiming that what is needed in such cases is a stimulus to the rectum, rather than an irritant applied throughout the whole length of the alimentary canal. If the "laxor" will alleviate what is probably to-day the commonest malady of mankind, owing to our evil civilized habits, we shall expect to see it widely used.

At least the essay has the merits of being novel and interesting.

R. K.



**THE EXPECTANT MOTHER AND HER BABY.**—By Bodh Raj Chopra, M.B., Ch.B. (Edin.), Lahoro. Pp. 157. Edinburgh: W. Green & Son, Ltd. Price, 7s. 6d. net. Obtainable from Messrs. Butterworth and Co. (India), Ltd. Price, Rs. 5-10 net.

THIS little book strikes a new note in medical publications by authors in India. In the first place the author, who is an Edinburgh student, has gone to British publishers, with the result that the book is admirably printed, free from typographical errors, well bound, and well published. Secondly, it is written especially from the Indian point of view whilst the author has a certain forcefulness of personality, which makes the book differ from the usual didactic and impersonal type of book dealing with the subject. Thirdly, he has some most interesting quotations from the *Charak Samhita*.

The book follows in the main upon the usual lines. In the first chapter infant mortality is considered with special reference to Indian conditions. A point of importance here is the author's protest against the wide advertisement of patent nostrums in India; India probably suffers from this evil more than any country in the world. Child marriage and the education of Indian girls are also matters on which there are interesting comments. Chapter II deals with the signs and course of pregnancy; here the dietary instructions for Indian mothers are well put together, and there are special comments on the dangers that may be indicated by bleeding from the vagina early in pregnancy. On pp. 20 and 21 there are delightful quotations from *Charak*; in a woman who lies upon her back, the umbilical cord twines round the neck of the foetus; an expectant mother who frequently engages in wordy warfare will bring forth an epileptic child; a woman who sleeps in an uncovered place or rambles at night brings forth a child that is insane; a woman that is fond of sweets brings forth a child that becomes subject to urinary diseases and obesity; a woman who is fond of pork brings forth a child that is of bloody eyes, or that becomes subject to asthma (food idiosyncrasy, we suppose), or that has hair exceedingly hard. Further, the expectant mother is warned against the practice of blood letting during the months of May and June that is popular in some parts of India.

These words of wisdom are those of a sage of ancient days, but we wonder what basis they have in observed facts. Even a "Western" physician, however, would hardly advise pork for an expectant mother.

In the next two chapters the care of the newborn infant and the subject of infant feeding are discussed. The author is opposed to the Indian custom of delaying weaning until a late period. There then comes a chapter on the wet-nurse or *daia*. This is important, for the author again writes with special reference to Indian conditions. *Charak's* ideal of a wet-nurse is quoted verbatim, and is full of common sense; the proposed *daia* should not be addicted to hunting, gambling, sleeping during the day, speaking ill of others, dancing, singing or instrumental music, or jealousy. Her milk should dissolve completely in water; milk that sinks in water is abnormal.

Subsequent chapters deal with weaning, artificial feeding, the hygiene of infancy, the normal growth and development of the baby, and the common ailments of infancy. The closing chapter—one which largely owes its inspiration to the teachings of Dr. John Thomson of Edinburgh—adds greatly to the value of the book, since it deals with the care of the mentally deficient child, the early signs of mental deficiency, and the home care of such children. The author's remarks on what "cow's milk" is like in India are very much to the point unfortunately, though one can hardly agree with him in attributing tuberculosis in childhood in India to milk; it is far more often due to the human strain of Koch's bacillus. In a second edition, also, one would like to see the section on infantile diarrhoea and dysentery expanded; dysentery in infants in India is usually of bacillary type, the stools are very infectious, and a nursing mother suffering from the disease, or one who has to prepare the family meals, is often the unconscious agent of wholesale spread of the infection.

We have devoted some considerable space to this book, but we consider that it is a very sound one, and that it will have a special appeal to workers in child welfare in India and to educated Indian mothers.

R. K.

**HEAT PYREXIA, NO HEAT STROKE, NO HEAT FEVER.**—By Lieut.-Col. C. J. McCartie, M.A., M.D., M.Ch., I.M.S. (ret'd.). Pp. 27. Dublin: Browne and Nolan Ltd. Indian Agents: Messrs. Thacker, Spink and Co. Price, 12 annas.

THIS is an interesting little essay, whose main contention is that there is no such thing as sudden sunstroke. In cases of apparently sudden heat hyperpyrexia there is always a prodromal phase during which the temperature of the body is rising; and the one special aetiological agent in sunstroke is the utterly unsuitable clothing which British troops wear in the tropics. Whilst the author's suggestions are interesting, either he or his printers are terrible "capitalists"—these are, for example, 8 unnecessary capital letters in four lines on the first page. Such over-emphasis irritates rather than attracts the reader. There are also such printer's errors as "Ossler" for "Osler," and "Mesopotamia" for "Mesopotamia."

Colonel McCartie, however, in our opinion is entirely right in his criticisms of the type of clothing advocated for European troops in the tropics. The doctrine of the flannel shirt for the British Tommy he condemns out of hand, also the cognate doctrine of "flannel next the skin," and that atrocity—the "cholera belt." It is a well known fact that British troops in India suffer far more severely than do British civilians from sunstroke; the author finds the explanation for this difference in the difference in their clothing; the civilian wears a twill shirt and a cotton suit in the hot weather, the Tommy a flannel shirt, and possibly a tightly buttoned up kahi serge tunic over it. Dress reform (for males) in the tropics is in fact the essence of his essay, and we are in complete agreement with him.

On the other hand, we wonder whether the author has paid sufficient attention to concurrent diseases as aetiological elements in the causation of sunstroke. This condition was extremely prevalent during the war in Mesopotamia, yet many of these cases were ones of malaria or of paratyphoid fever, in which hyperpyrexia set in after hours of exposure to a burning sun.

The problem of heat hyperpyrexia is especially one for the military medical authorities in India, as also one on which we would welcome information. Colonel McCartie is admittedly an enthusiast for cool clothing in the hot weather in the tropics. The Englishwoman in the tropics is already ahead of him. "Dress reform" means something more important in the tropics than in the temperate zone; it has a special bearing on the health of the immigrant white races and on the problem of heat hyperpyrexia.

R. K.

**THE HYGIENE OF MARRIAGE.**—By Isabel E. Hutton, M.D. Second Edition. Pp. 125 plus X. London: William Heinemann (Medical Books), Ltd.

Of the very many books on sex hygiene for lay persons this is probably the best, for it is simply and clearly written, and the difficult subject is handled without offending good taste. "I hope" writes the author in the preface to her first edition "that in this work parents will find a suitable book to put into the hands of their sons and daughters who are about to be married..... The matter has been simply treated, nevertheless it is quite scientific and no attempt has been made to embellish it."

The second edition contains new chapters or sections on the menopause and on menstruation. A new chapter on sterility has also been added, and this is very well written, for it contains clear indications as to when to consult a doctor. The chapter on birth control has been amplified. In this connection we are entirely in agreement with the author in her remarks in the preface; birth control has become a commercial business, and present-day methods are not based, as far as one knows,

on scientific evidence. This problem is one which the medical profession will have to study sooner or later, for it cannot be left to lay investigation.

The second edition of this book now covers the whole period of reproductive life, including the menopause. It is inevitable—even desirable—that there should be a demand for books of this type; the one under consideration is the best that we have seen. The author writes that "she has been amazed to find that there are many people who have been married for several years who are in great need of help over their sex life, more especially during and after the 'change of life.'" Medical experience will bear her out, and the book is one of which we cordially approve.

R. K.

## Annual Reports.

THE ROCKEFELLER FOUNDATION: A REVIEW FOR 1928. BY GEORGE E. VINCENT, PRESIDENT OF THE FOUNDATION. Pp. 54; PROFUSELY ILLUSTRATED. PUBLISHED IN NEW YORK.

SOME idea of the manifold activities of the Rockefeller Foundation may be gathered from the following synopsis at the beginning of this report on its work in 1928:—

During 1928 the Rockefeller Foundation, in disbursing from income and capital \$21,690,738, (1) contributed to the development of medical sciences through provision of funds for land, buildings, operation, or endowment for eighteen medical schools in fourteen countries; (2) provided for the support of the Peking Union Medical College; (3) made minor appropriations for improving premedical instruction in China and Siam, for operating expenses of seventeen hospitals in China, and for laboratory supplies, equipment, and literature for European medical centres which are still feeling the after-effects of the war; (4) through small grants assisted certain departments of medical schools in France, Italy, and Ireland which offer exceptional facilities for graduate study; (5) continued to contribute towards the advancement of the biological sciences in institutions in four countries; (6) assisted the development of professional public health training in eight schools and institutes in seven countries and in twelve field training stations in the United States and abroad; (7) gave aid to fifteen nurse training schools in ten countries; (8) helped Brazil to combat a new outbreak of yellow fever; (9) continued studies of that disease on the West Coast of Africa; (10) took part in malaria control demonstrations or surveys in six of the American states and in eighteen foreign countries; (11) continued contributions towards the emergency budgets of eighty-five county health organizations in seven states of the Mississippi flood area; (12) aided the governments of twenty-one countries in fighting hookworm disease; (13) gave funds to organized rural health services in 191 counties in the United States and towards state supervision of such services in fourteen states in that country, and assisted in local health work in twenty-three foreign countries; (14) aided in the establishment or maintenance of certain essential divisions in the national health services of twenty-three foreign countries and in the state health departments of nineteen American states; (15) provided, directly or indirectly, fellowships for 802 men and women from forty-six different countries, paid the travelling expenses of sixty-one officials or professors making study visits in the United States or abroad and provided similar opportunities for 127 nurses and other public health workers; (16) contributed to the work of the Health Organization of the League of Nations through the support of international interchanges of public health personnel and the development of a world-wide service of epidemiological intelligence and public health statistics; (17) lent staff members as consultants to

many foreign governments; (18) made surveys of health conditions or of medical or nursing education in five countries; (19) collaborated with the Rockefeller Institute for Medical Research in field studies of respiratory diseases and verruga peruana; (20) assisted in mental hygiene projects in the United States and Canada, in demonstrations in dispensary development, research, and teaching in hospitals and clinics in New York City, and in numerous other undertakings in public health, medical education, and allied fields.

The Rockefeller Foundation was originally established in 1909 for the control of hookworm disease in the United States, as the Rockefeller Sanitary Commission. It was later reorganized as the International Health Board. The temporary anti-hookworm campaigns in the southern United States, however, have now expanded into permanent official rural health organizations, whilst multifarious teaching and public health organizations have been created all over the world. One of the most important decisions came to in 1928 was to create a new public health institute under the Government of India at Calcutta; this new building will be adjacent to the Calcutta School of Tropical Medicine, and the staff of both institutions will train students both for the D. T. M. diploma of the Bengal Faculty of Tropical Medicine and for the D. P. H. diploma of Calcutta University. Further, up to December 1928, the Rockefeller Foundation had provided no less than 3,187 fellowships—a most important part of their programme.

A reorganization of the central and controlling Board took place in 1928, resulting in the creation of two special central organizations, the General Education Board for the United States, and the world-wide Rockefeller Foundation itself. The combined resources amount to \$203,000,000, with outstanding obligations of \$35,000,000.

Turning to local activities, the year saw important developments at the Lyon Medical Centre. Eighteen medical schools, from Edinburgh to Beirut, received financial assistance. The Peking Union Medical College is well on the way towards autonomy. Health education everywhere, both in the laboratory and in the field, was subsidized. In May 1928, yellow fever which it was hoped in 1927 had been abolished from South America, reappeared in Rio de Janeiro—108 cases with a 50 per cent. mortality. This outbreak, however, is now well under control again. Yellow fever was also studied in West Africa and in the Rockefeller Institute for Medical Research in New York. The year saw the tragic deaths of Professor Noguchi and Dr. W. A. Young from this disease in the field; also the proof that yellow fever is due to a filterable virus, and not to the supposed *Leptospira icteroides*, and the demonstration of the susceptibility of the monkey *Macacus rhesus* to the disease. The American and African viruses have been proved to be identical.

"Thinking like a malaria mosquito" is an interesting section of the report; the malariologist must learn to think like a mosquito. The various differing views with regard to methods of malaria control are discussed. Essentially, however, malaria is a local problem, and what suits one area may not suit another. Hookworm disease is regarded by the Foundation as "the advance agent of public health organization;" and in 1928 anti-hookworm campaigns were carried out in no less than fifteen different countries. Health organizations were maintained in the flooded areas in the Mississippi Valley; and local health programmes developed in many countries from Warsaw to Shanghai. Of fellowships granted during the year, 218 were in advanced training for the promotion of teaching and research, and 584 designed to prepare men and women for specified positions in medical schools, schools of nursing, health organizations, etc. The services of experts were lent freely to foreign countries. Publications were more numerous than ever. A special investigation during the year was undertaken into the value of Calmette's vaccination against tuberculosis.

In brief, a most interesting report on a most wonderful year of work.

THE SIXTY-FIFTH ANNUAL REPORT OF THE DIRECTOR OF PUBLIC HEALTH, MADRAS, FOR THE YEAR 1928. BY CAPT. N. R. UBHAYA, L.R.C.P. & S., D.P.H., ACTING DIRECTOR OF PUBLIC HEALTH, MADRAS, SUPDT., GOVT. PRINTING, MADRAS. PRICE RE. 1-4-0.

THIS report is well summarized in the covering Government resolution from which we have taken the following abstract. One regrets very much that it is the last report on the work of Lieut.-Col. Russell, I.M.S., whose many years of public health work have resulted in so much progress in Madras Presidency.

The total number of deaths (1,080,744) from all causes during the year was the highest on record for the quinquennium, and was more than the quinquennial average (1,026,723) by about 54,000. As compared with the previous year there was an increase of about 83,000 deaths during the year under review.

**Cholera.**—With the exception of the Nilgiris and Malabar, which may be said to have been practically free, every district was infected. There was a marked increase in mortality from 35,334 during 1927 to 57,677. The death-rates for 1927 and 1928 were 0.9 and 1.4, respectively, against the quinquennial average of 0.8 per mille. The epidemic was severe in nine districts with mortality rates over two per mille. Compared with 1927 the increase in the death-rate was marked in the districts of Cuddapah (+ 6.6), Kurnool (+ 3.2), and Chingleput (+ 2.4) and the largest decrease was recorded in Rāmnād. Eighteen municipalities were entirely free. The minimum and maximum incidence were severally recorded during the second and third quarters of the year. It is observed that effective measures were taken to combat the disease. Anti-cholera inoculation during the year gave ample proof of its protective value. The Director of Public Health points out, however, that the present methods of combating the disease are only palliative, and if the disease is to be combated effectively, the authorities should attend promptly to the provision of a protected water-supply wherever cholera is likely to break out as an epidemic. It is equally necessary that adequate sanitary arrangements should be made at festival centres and that irrigation channels should be kept in a sanitary condition.

**Smallpox.**—No district was free from smallpox, though there has been a progressive decline in mortality during the last three years. Seven thousand six hundred and eighteen deaths were recorded as against 7,781 during 1927. The death-rate was 0.2 per mille, the same as during 1927, against the quinquennial average of 0.4 per mille. While 48 municipalities recorded a death-rate of 0.2 during the previous year, 43 recorded 0.4 per mille in 1928. More than 50 per cent. of the mortality occurred in Madras, Calicut and Mannārgudi. Sixty-four rural towns registered 306 deaths from smallpox against 377 in 72 towns during 1927. The mortality classified according to age distribution showed that the incidence was as high as 40 per cent. in the age period under one. It is therefore clear that primary vaccination still requires great improvement. South Arcot continued to return the largest number of deaths in the Presidency. The local bodies in the district should employ adequate vaccination staff. The Director of Public Health brings again to the notice of the Government that delay occurs in the notification of the disease. It is needless to emphasize the importance of sending prompt intimation of any outbreak of the disease to the Public Health Department. Collectors should realize that failure to report outbreaks and delay in the submission of reports permit the establishment of epidemic conditions before preventive measures can be initiated.

**Plague.**—The number (2,106) of deaths from plague during the year under review approximated to that (2,014) in 1925, which was the lowest on record since the disease first made its appearance in the Presidency and it represents a death-rate of 0.1 per mille, the same as the quinquennial average. Eighteen districts were entirely free. The largest number of deaths was

as before in Madura and Bellary which were responsible for about 67 per cent. of the total mortality in the affected districts. Of the 12 municipal towns affected, Hindupur which had been free for a long time, recorded the highest death-rate of 3.9 per mille, while in Hospet, the most plague-ridden town in the previous years, the rate fell from 4.7 to 0.3.

**Malaria.**—The appointment of a special officer to investigate the conditions regarding malaria in the Presidency, the free distribution of quinine in specially malarial tracts and the adoption by the local bodies concerned of the measures suggested to combat the disease, prove that the malaria problem is beginning to be dealt with seriously.

With the exception of Cuddapah, the municipal areas in which the Special Malaria Officer made investigations did not show any appreciable evidence of malarial endemicity, the spleen rate in each case being 2 per cent. or less. The case is, however, different in the rural areas. Puttur, Koilkuntla, Siruguppa, Talaman-chipatnam and Humma are all reported to be typical areas of hyperendemicity.

The scheme of free distribution of quinine as judged from its progress during the year under review was successful. Quinine treatment is beginning to be popular. The Government have under consideration a proposal to reduce the price of quinine below the commercial price as a public health measure.

**Relapsing fever.**—Coimbatore, Madura and the Nilgiri districts continued to be affected, but the infection was not severe in any of them. These districts registered 119 deaths from this cause. The establishment of the disease in Udamalpet and Dhārāpuram taluks in the Coimbatore district should receive the early attention of the local bodies concerned and the Public Health Department, and vigorous measures should be adopted to combat the disease.

**Respiratory diseases.**—There was a marked increase in mortality during the quinquennium. The total deaths registered amounted to 90,012 compared with 81,227 in 1927, representing rates of 2.2 and 2.0 per mille, respectively, the quinquennial average being 1.8. The Government await with interest the results of the detailed investigation of the statistics of individual districts and towns, proposed by the Director of Public Health to determine the causes of the increase.

**Hookworm.**—The Ankylostomiasis Campaign was taken over entirely by the Government from the International Health Board of New York from 1st April, 1928, and incorporated as an integral part of the activities of the Public Health Department under the designation of the "Rural Sanitation Campaign." One thousand five hundred and five lectures were given to an audience of over two lakhs and 62,914 treatments were given by the campaign staff in schools, villages and on estates, while the medical officers in charge of hospitals and dispensaries treated 144,475 persons. The experimental work begun at the Madras Presidency Penitentiary in September 1926 was continued throughout the year under review. The campaign staff engaged in the prevention of soil pollution with a view to secure as great a measure of success as possible utilized to a great advantage the dozen earth-boring tools purchased for making deep borehole latrines. Local bodies also showed greater interest in this branch of work. The Health Officer, Planters' District, and his staff visited 63 estates in the Nilgiri and Wynaad districts and administered a total of 14,337 anti-hookworm treatments.

**Registration of vital statistics.**—Though as a result of the reorganization of the Public Health Department considerable improvement has been effected in the registration and compilation of vital statistics, yet the work is reported to suffer from serious defects which only an earnest endeavour on the part of the local authorities can remedy. One of these defects is stated to be the incomplete enumeration of births and deaths, especially in the rural areas. In these areas about 76,500 births and 23,200 deaths which were not registered were detected during the year by the District Health staff. Collectors of districts are requested to instruct the local

revenue authorities to take measures to remove this defect.

The Government have already impressed on the Collectors the necessity of extending the provisions of the Madras Registration of Births and Deaths Act (III of 1899) to all the rural areas in this Presidency. In spite of this no appreciable progress was made in that direction in 1928. Collectors are requested to give this matter their serious attention and submit proposals for the extension of the Act to all rural areas or at least to all villages with a population of 2,000 and above. It is very unsatisfactory that although registration is compulsory in municipal areas, as many as 30 per cent. of the municipalities returned birth-rates less than 35 per mille, the worst instances in this respect being Tiruvārūr, Erode, Nandyal and Srirangam. The Tiruvārūr Municipal Council is reported to be very refractory to criticisms and suggestions for improvement and the council is reminded that it is open to the Government to substitute coercive for persuasive methods. The municipal councils of the towns named above should lose no time in taking the necessary steps to improve this important branch of municipal administration. It is further reported that the birth and death registers are full of irregularities of omission and commission which seriously affect the value of the records. In G. O. No. 1243, P. H., dated 10th May, 1929, the Government have published for general criticism draft rules prescribing the minimum educational standards for the municipal birth and death registrars and these rules will be confirmed shortly. The Government trust that when these rules come into force many of the defects now noticed will cease to exist. The Director of Public Health brings to notice that incompleteness of vital statistics returns still prevails to an appreciable degree in the districts of Guntūr, Nellore and Tanjore.

The recorded birth-rate of the Presidency rose from 36.5 to 37.4 per mille against the estimated Presidency average rate of 42.5. Thirteen districts reported increases which were most marked in Malabar, Gōdāvari East, Madura and Rāmnād. Ganjām and Cuddapah recorded the largest decreases. The birth-rates exceeded the death-rates in all districts except Cuddapah, Kurnool and Madras. The registered birth-rate in municipalities rose from 39.4 to 40.1, while that in rural towns showed slight decrease, viz., from 36.7 to 36.4. The highest birth-rates in municipalities were recorded in Salem, Kodaikānal, Guntūr, Chingleput and Bōdinayakkauūr, while the lowest rates were reported from Erode, Tiruvārūr, Nandyal, Palacole and Srirangam. The low birth-rate in these five municipalities is attributed to defective registration, which in spite of criticisms in the past has received little attention from the municipal authorities concerned.

**Death-rate.**—The recorded death-rate for the Presidency rose from 24.3 to 26.4 per mille according to the crude rates calculated on the 1921 census population, and it was 23.5 per mille when calculated with reference to the assumed natural increase in population. The death-rates in 18 districts show increases when compared with the previous year, the largest variations being recorded in Cuddapah and Kurnool. The largest decrease in the death-rate was in Ganjām. The recorded death-rates for municipal and rural areas rose from 30.6 and 24.0 to 33.7 and 25.2, respectively. In six municipalities, namely, Erode, Berhampur, Palacole, Vellore, Ellore and Vāniyambādi, the death-rate was below 20 per mille, and the absurdly low rate reported from Erode (14.5) and Berhampur (15.5) is attributed to defective registration. The attention of the municipal councils concerned is drawn to this defect and they are requested to rectify it. The infantile death-rate during the year under review rose from 175.4 to 184.2 per mille of the registered births, the maximum being recorded by the Kurnool district (235.6) and the minimum by Rāmnād (140.0) and rates above 200 were recorded by five districts, namely, Mettūr, Kistna, Gōdāvari West, Guntūr and Kurnool. Marked decreases occurred in Madura and Trichinopoly. The rate also rose in municipal towns from 186.7 to 202.5, very high rates being recorded by Palni, Masulipatam, Guntūr,

Vizagapatam and Madras. The results set forth above prove conclusively that preventive measures are very urgently needed in these towns. The municipal councils concerned are requested to take very early steps to bring about improvement in this direction.

**Maternity and child-welfare.**—There was a further and marked increase in the number of deaths registered in the Presidency as being due to or arising from child-birth, from 7,902 to 11,150. The increase is, however, attributed in part to improved registration of causes of deaths. It is regrettable that only 3.2 per cent. of the confinements in rural areas received skilled aid. Although the Government have repeatedly directed that local bodies should pay more attention to the health of the mother and child, it is disappointing that there was no appreciable response. There were in 1928 only 69 maternity and child-welfare centres in the Presidency, though this was 14 more than in the previous year.

The Government are glad that the preliminary investigation of this problem was undertaken during the year in Madras, Madura, Trichinopoly and Coimbatore. They trust that further investigation will enable the Public Health Department and local bodies to deal with the problem efficiently and successfully. In this connection the Government congratulate Dr. Adishesan on the useful research work done by him during the year.

**Propaganda.**—With the establishment of the Propaganda section in the office of the Director of Public Health, health publicity in the Presidency is steadily developing. The Irwin cup for the best conducted Health Week in India was awarded to the Pnukonda Union.

During the year 108,997 lectures (excluding magic lantern demonstrations) were delivered in over 50,000 centres to audiences totalling over 6½ millions, representing an increase of about 17,200 lectures, 9,000 centres and an audience of 900,000 as compared with the previous year. The cinema was employed by a few local bodies to educate the masses in health problems. The total number of cinema shows on Public Health subjects was 293 in 1928. The progress made by the Propaganda section during the year was good. The Government note with regret that the municipalities of Tenali, Ongole, Palacole and Tiruvannāmalai have been persistently neglecting propaganda work and that the work done in Gudiyāttam, Peddapur, Villupuram and Narsaraopet has been far from satisfactory.

**Sanitary works.**—During the year no new water-supply scheme was brought into operation. The Vellore drainage scheme was completed and handed over to the municipality, while the Madura drainage scheme was also practically completed except for a few minor works.

During the year, nine water-supply schemes and improvements to four schemes were under execution by the Public Works Department. Besides these, seven other water-supply improvement works were entrusted to municipalities for execution. They were in Periyakulam, Vizagapatam, Vizianagram, Bezwada, Tirupati, Guntūr and Ongole.

The Gōbichettipālaiyam water-supply scheme was sanctioned during the year, while the financing of four schemes (Madura water-works improvements, third stage, Erode drainage, Gudur water-supply and Saidapet water-supply), for which plans and estimates had been prepared, was under the consideration of Government. Besides these, there were 16 water-supply and drainage schemes relating to local bodies (including improvements to certain existing works), for which plans and estimates were under preparation. Investigation of various other schemes with approximate estimates was completed, chief of these being the water-supply schemes of Sembiam, Walajapet, Tiruvallur, Tadpatri, Hospet, Virudhunagar, Dēvakōttai and Cochin and the drainage schemes of Sembiam, Coimbatore, Vizianagram and Vizagapatam.

Three reports on the experiments conducted regarding the filtration of water were submitted to

Government. Very valuable results were obtained from those experiments.

**BENGAL PUBLIC HEALTH REPORT FOR THE YEAR 1927. BY DR. C. A. BENTLEY, M.B., D.P.H., D.T.M. & H., CALCUTTA, BENGAL SECRETARIAT BOOK DEPOT, 1929. PRICE RS. 6-10-0.**

DR. BENTLEY'S annual reports are always interesting reading, and the present one is no exception to the rule. A special feature of these reports is that they are admirably illustrated by graphs and charts.

Rainfall was in slight defect generally in Bengal in 1927, the year being a rather dry one with a prolonged hot weather. The total population on which the returns are based may be taken as 46,522,293. The central feature of the report is that, notwithstanding higher mortality than usual from cholera and smallpox, the population of Bengal continued to increase, naturally not quite to the same extent as in the previous year. As compared with the previous year the total number of births rose from 1,276,380 to 1,286,863, and the deaths from 1,151,197 to 1,189,370. Allowing for a probable omission of 27 per cent. in the registration of births and deaths, actual birth- and death-rates of the province may be assumed to be 35.17 and 32.51 respectively. A beginning was made in 1927 with the transfer of the responsibility for collecting vital statistics to Union Boards, a function for which provision is made in the Village Self-Government Act, but which they have been on the whole somewhat reluctant to assume.

A number of interesting maps show at a glance the chief points in connection with vital statistics for the province. Taking the natural rate of increase per mille of the population in the different provinces of India, the Punjab heads the list with a figure of 14.8, and Bengal is last with a figure of only 2.1 per mille. Calcutta, Jessore, Howrah, the 24-Perganas, Hooghly, Khulna and Bakarganj all showed an excess of deaths over births. Since 1898 the birth-rate in Bengal has shown a steady decline, but so also has the mortality rate, and this is shown on p. 11 in a striking graph. Six districts only showed an increase in the birth-rate in 1927 over the ten year average, and eleven an increase in the corresponding death-rate. Dinajpur, Rajshahi, and Murshidabad all showed a total mortality of over 30 per mille.

**Infant Mortality.**—The number of deaths among infants under one year of age was 229,078 as compared with 251,184 during the previous year, the decrease in the reported rate of infantile mortality being 9.6 per cent. As usual more male infants died than female infants. Calcutta and Bakarganj showed an increase in infant mortality over the average of ten years, and on p. 23 is given a very interesting set of graphs showing changes in infant mortality in different districts from 1921 to 1927; Calcutta tops the list with 340 infant deaths per 1,000 births. (This, however, as in all the large cities of India, is to some extent due to the fact that very many Hindu women return to their homes in the *mofussil* for their confinement; the birth is thus recorded in the *mofussil*, but the child's death after its return to the city is recorded in the vital statistics for the city. This error is prevalent in all the records for such cities as Calcutta, Bombay, and Madras, and makes the actual case out worse than it really is.)

With regard to maternity and child-welfare, extremely interesting results have been obtained in Calcutta and Dacca by special attention to midwifery and the care of infant life. In Calcutta there were five units at work staffed by 5 lady health visitors and 18 midwives. In 4,748 cases attended by them the death-rate during the first ten days of infancy was only 35.5 per thousand as against the average for the city of 104.8 per thousand, while only 13 cases proved fatal to the parent. Two maternity centres working in the town of Dacca, and dealing with slightly over a thousand cases, reported a mortality during the first ten days of infancy of only 22 per thousand as against a recorded mortality of 96 per thousand in the rest of the town. These figures

go to show what can be accomplished by the proper care of mothers and infants.

During the year under review grants-in-aid were made to various local bodies for starting 100 classes of 10 *dais* each. In all 1,170 *dais* received training in 104 classes started by 49 local bodies and one health society. Public interest in maternity work and infant welfare was maintained and 67 health exhibitions and Baby Week functions were held during the year.

#### HISTORY OF THE CHIEF DISEASES.

**Cholera.**—The year 1927 was a bad one for cholera in Bengal, the epidemic season setting in, however, later in the year than usual. In Malda district 17.9 per cent. of all deaths during the year were due to cholera. The riverine districts are especially affected, and the Darjeeling district hardly at all.

The mortality from cholera was 118,377 in 1927 as compared with 59,106 in 1926, showing an increase of 92.3 per cent. above that year and also above the decennial average. The measures taken to cope with the epidemic included inoculation, disinfection of water-supplies, disinfection of infected houses and of the patients' clothes and supply of bleaching powder. Twenty medical officers and a temporary epidemic staff of 20 Sub-Assistant Surgeons and 100 sanitary inspectors were deputed to help local bodies in suppressing outbreaks. The publicity work carried on by the Publicity Branch of the Public Health Department by means of lectures and magic lantern demonstrations and free distribution of posters and leaflets on the prevention of cholera has gone far to show the public how far cholera may be regarded as a preventable disease. Local bodies concerned kept special watch over pilgrims for the Puri *rathjatra* and the Ganga Sagar *mela* with a view to detecting suspected cases.

The cholera epidemic of the year 1927 gave the first impetus to the mass vaccination for cholera which made such remarkable strides. In 1927 1,299,630 c.c.s. of cholera vaccine were issued as against 256,000 in 1926, while the number of inoculations reported jumped to 781,872 from 57,395 in the previous year.

**Smallpox.**—The mortality from smallpox was also distinctly above the average, 42,514 deaths being reported as against 25,548 in the previous year. The epidemic was attended with an increase of over 20 per cent. in activity in vaccination and nearly four million adults and children were vaccinated during the year. More than half of the precise total of 3,975,837 were revaccinations, but the number of primary vaccinations 1,928,674 was well above the total number of births reported. Protection is obviously increasing so long as more persons are vaccinated for the first time than are born in the year, but the actual percentage of successful vaccinations among the infants of 1927 was only 26.1 and slightly less than that of 1926.

**Fevers.**—The death-rate from "fevers" was 17.0 per mille, as compared with a figure of 17.7 for 1926. A graph on p. 45 shows how the rates vary year by year in the different districts. The chief fever season was from June to November, as usual. Nadia and Burdwan were the only districts to show fever indices from malaria of over 50 per cent.

Of anti-malaria schemes, the result of the Banka Valley scheme was good, flushing being carried out from July to October. In the Singaran-Toposi scheme the Singaran river, which breeds enormous numbers of *A. culicifacies*, was flushed; here not only has malaria decreased, but with it also the infant mortality. At Meenglas Tea Estate the spleen index has come down to about 57 per cent. and now appears to be remaining at about that figure. The work of the very numerous anti-malaria societies whose activities now almost cover the province is dealt with on pp. 51 to 53 of the report.

The figure for kala-azar is less than for previous years, and it appears likely that the peak of high incidence of recent years—largely due to better methods of diagnosis, and the increasing popularity of treatment—has been passed. Enteric fever is on the increase in the towns, again possibly because of better diagnostic



methods. Relapsing fever was unimportant, and only one case of plague was reported during the year. Dysentery and diarrhoea showed an increase, associated with the special incidence of cholera during the year; there was also an increase in the number of deaths from respiratory diseases.

**Tuberculosis.**—The figures suggest that the incidence of pulmonary tuberculosis is gradually rising in Bengal. Kurseong reported the highest death-rate from this disease—3.6 per mille, Darjeeling a figure of 3.3, and Calcutta one of 2.5.

**Miscellanea.**—The port health activities were carried on as usual in Calcutta and Chittagong, the only events of note being an outbreak of measles on the S.S. *Ganges*, and a mild outbreak of beriberi among the crew of the Chittagong Port Trust vessels.

The Bengal Public Health Laboratory examined 1,933 routine specimens during the year, and carried out a considerable volume of research work on milk, the constants for pure buffalo *ghee*, imported and adulterated *ghee*, and tube well waters. Mustard oil is perhaps more commonly adulterated than any other article of diet among the population in general.

The year surpassed all past records with reference to school hygiene, 196 schools having been inspected. In all 1,170 *dais* received training in 104 classes. The Publicity Officer, Rai Sahib K. P. Ray, did excellent work, whilst the Eastern Bengal Railway demonstration train, which tours the districts giving cinema and other demonstrations, was a great success; no less than 186,000 people visited the demonstration health car. The usual precautions were taken with regard to fairs and melas.

**Rural Public Health Organization.**—The year 1927 witnessed the beginning on a small scale of a movement which may have far-reaching effects in remodelling public health organization in the districts in future years. This is the system of founding public health circles corresponding in area to a *thana*, to each of which is attached an officer specially trained in public health work. Towards the cost of such centres Government contribute the actual expenses up to Rs. 2,000 for each unit per annum. With the assistance of Public Health Committees for the *thanas* it is not difficult to foresee how such centres may on the one hand facilitate the decentralization of public health work from District Board headquarters, and on the other hand link up the efforts of individual Union Boards for the improvement of public health in the *thana* as a whole. Among other advantages they should ultimately afford a medium for the better control and inspection of vaccination. These new public health circles were first brought into existence in August 1927 and 258 had been established by the end of March 1928.

**Public Health Department, Engineering Branch.**—In time of financial stringency lump grants for expenditure in the province as a whole are more easily justified than specific provision for works of sanitary engineering for the benefit of one town or another, and for this reason the public health engineer feels the pinch more acutely than the medical and scientific branch of the public health establishment. There were actually in progress, however, in 1927 under the Chief Engineer ten schemes of water-supply and drainage in various stages, while eight other schemes were completed during the year; and the work of preparing further schemes for provision in later years went on so far as there was any practical possibility of their realization.

ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF ASSAM FOR THE YEAR 1928. BY MAJOR S. L. MITRA, B.Sc., M.B., Ch.B., D.T.M. & H., I.M.S., SHILLONG, ASSAM GOVERNMENT PRESS, 1929. PRICE RS. 2-7-0.

LIEUT.-COL. MURISON, I.M.S., held charge throughout the year, but proceeded on leave before this report was written. After an introduction dealing with general meteorological conditions for the year, the report proceeds to a discussion of vital statistics. These are based on an approximate (pains) population of 6,852,242.

**Vital Statistics.**—Both the birth-rate and the death-rate improved during the year 1928, and the excess of the former over the latter, which represents the natural increase of the population, was higher than in any year since the reconstitution of the province in 1912. The birth-rate rose from 30.25 per mille in the previous year (and 30.01, the quinquennial average) to 31.24, and the death-rate decreased from 23.47 in the preceding year (and 23.97, the quinquennial average) to 22.16 per mille. Only in two other provinces, namely, Burma and the North-West Frontier Province, was a lower death-rate recorded. The Director of Public Health attributes these satisfactory features, which, despite the dubiety of such comparisons owing to defects in registration, are reflected in the statistics of mortality from all the principal diseases except smallpox, to better health conditions following the favourable climatic factors of the year and to prosecution of the intensive campaigns against cholera and kala-azar.

The death-rate on the tea estates, 18.01 per mille, was again considerably lower than the provincial rate. This is evidently due to the better sanitary conditions and supervision prevailing on the tea estates; and, though the proportion of births is still lower than that in the province as a whole, the increase in the garden population was 10.1 per mille or 1.03 more than the provincial increase. The health of the larger towns was also satisfactory, save in Shillong, where the problems of sanitation have caused Government some concern.

There was no change in the agency employed for the collection and registration of vital statistics. Since, as was pointed out in the resolution on the last annual report, the value for statistical purposes of the registration returns depends upon the accuracy of the collection, it is regrettable that there was also little improvement in the work of the agency responsible. Birth-rates in the rural areas range between 56.79 and 3.67 and death-rates between 43.61 and 3.50, figures only too indicative of defects. The percentage of omissions found by the vaccination staff in checking urban registration was considerably higher for both births and deaths than last year, and it is clear, as the Director of Public Health points out, that more attention must be paid to this check particularly in the smaller towns and also in Sibsagar and Golaghat. Though registration is compulsory in the towns, no less than three important towns, including Shillong, appear to have made no check at all.

**Infant Mortality.**—Infant mortality in Assam is still at the high figure of 172 deaths per mille of live births, but this compared favourably with such provinces as the Central Provinces, where the figure is 238, and Burma with a figure of 209. The figure for Assam has very slowly declined from 197 in 1912 to its present level.

**History of the Chief Diseases.**—Influenza was unimportant during the year. Cholera was less important than in the epidemic year of 1927. The covering Government resolution to the report on this reads as follows:—

Government observe with satisfaction the decrease in the number of deaths from cholera reported during the year, which were 6,915 as compared with 15,392 in 1927. A temporary epidemic unit was created for the district of Goalpara, which had lightly escaped in 1927 but showed the highest death-rate from cholera, i.e., 2.30, in 1928. The epidemic staff in Sylhet, which district reported the next highest death-rate, was increased by two more units consisting of six sub-assistant surgeons and twelve disinfectant carriers. The epidemic units appear to have fully justified their existence, though the system of co-ordination enabled the assistant and the sub-assistant surgeons of the kala-azar staff, the sub-assistant surgeons of the local board dispensaries and the subdivisional medical officers also to play their part. The units were employed, in addition to the actual treatment of patients, on the disinfection of water-supplies, inoculation of all possible contacts with anti-cholera vaccine, and the instruction of the people in the dangers arising from impure water by magic lantern slides and other means. It has been



mentioned that the figures show people to be taking more freely to inoculation. The manufacture of cholera vaccine at the provincial Pasteur Institute has been satisfactory in enabling prompt supplies to be made. An important step has been taken in the manufacture of combined cholera and dysentery bacteriophage at the Pasteur Institute and its administration both as a prophylactic and as a remedy in selected areas. The method as applied to epidemics is still in an experimental stage, but the results are remarkably encouraging. The problem of manufacturing a uniform product is nearing solution. That, however, of securing proper controls in the field is, Government understand, the chief difficulty in the experiment. A demonstration of the value of this product as a simple and readily available tool in epidemics of cholera and dysentery would be of more than provincial importance.

*Smallpox* was severe during the year; a total of 8,461 deaths as compared with 5,237 in the previous year. It was especially prevalent in Sylhet, Cachar, and Goalpara.

The total number of deaths registered from smallpox during the year under report was 8,461 as compared with 5,237 in the preceding year. The death-rates for the two years were 1.23 and 0.76 respectively, as compared with 0.42, the average of the previous ten years. The increase in mortality from smallpox, particularly in Sylhet, is, according to the Director of Public Health, mainly due to defective vaccination and slackness in supervision of the work of the vaccinators. Though the vaccinating staff has recently been increased, he has called attention to a more serious defect than shortage of staff in the absence of efficient control. The provision of an adequate supervising staff of rural health officers as adumbrated in the resolution on the last report may not be possible in the early future. Meanwhile Government have under consideration the possibility of improving the means of control, so far as the fault lies with the rules and orders and with division of responsibility between the Civil Surgeons and the local boards.

The report for 1928 includes for the first time a chapter corresponding with the triennial report hitherto separately published on vaccination, and the Director has therefore included the vaccination figures for the past three years. In future only annual figures will be required. The results are interesting, and the Governor and his Minister are glad to observe that they indicate a growing popularity of vaccination among the masses. This may in part be due to the advantages attending the use of anti-cholera vaccine and the phenomenal success of kala-azar injections.

*Fever*s accounted for a mortality of 13.03 per mille, a relatively low figure. The deaths from this cause have dropped from 1,13,098 in 1924 to 89,255 in 1928. Nazira and Doom Dooma reported high fever incidence, but as there are no medical officers of health in either town, this may be due to inaccurate reporting by village chowkidars. Deaths from kala-azar in Assam increased from 1,667 in 1919 to 6,365 in 1925, and then decreased to 1,660 in 1928. Cases treated rose from 7,118 in 1920 to 60,940 in 1925, and have thereafter declined to 23,576 in 1928. In other words, the strenuous efforts of the kala-azar survey staff in Assam are now bearing fruit, and the disease is steadily being brought under control. The North Cachar Hills require re-survey.

Anti-malaria measures were continued at Pasighat, Haflong, Kohima and Lumding and were undertaken in the forest area at Kachugaon in the Goalpara district. Malaria is, however, of such widespread importance in Assam that these measures hardly touch the fringe of the problem. As quinine treatment must always form a prime factor in dealing with this disease, the Governor and his Minister are glad to hear that the number of parcels of quinine sold during the year rose to 7,841 from 5,570 in 1927. They hope, however, that the time may not be long delayed when it will be possible to organize a campaign against the root causes of malaria, which continues to be a constant cause not only of sickness and death but also in all probability of lowered vitality.

The campaign against kala-azar was continued with vigour as in preceding years. The number of deaths from kala-azar fell from 2,859 in 1927 to 1,660 in 1928, and the number of cases from 33,415 to 23,576 in the two years. This satisfactory result, as the Director remarks, is due to the continuance of free treatment with urea stibamine throughout the province. The Governor and his Minister have read with pleasure the account of the good work done by the special staff, and of the co-operation of the Civil Surgeons and their subordinates. They fully recognize the difficulties met with by the staff engaged in such a campaign, especially in a primitive and rugged area like the Garo Hills, and regard it as therefore all the more important that the staff should be carefully selected for the purpose, and hill men utilized as far as possible for work among the hill tribes.

It is observed that there is a satisfactory increase in the expenditure of local bodies upon conservancy, but that the amount spent upon drainage is still lamentably small. Proper drainage constitutes an important health factor, especially in malarious places. It is hoped that a Public Health Engineer will shortly be appointed and that the Director will in the future find less matter for adverse comment in the sanitation of the towns.

Dysentery and diarrhoea accounted for a death-rate of 1.24 per mille, whilst the incidence in tea estates was reported to be lower than in the previous year. Plague was absent.

"The Governor and his Minister" have perused with interest the remarks of the Director concludes the covering Government resolution, anent the prevalence of food adulteration. They are at present in doubt whether the Public Health scheme mentioned by him in view of the recent floods will be financially possible in the immediate future. His opinion that there is need for a provincial Food Adulteration Act engages attention. It is, however, a question requiring close consideration whether the existing provisions of law are not adequate in view of the present limitations of staff and popular education, and in particular whether the provincial laboratory as at present constituted would be capable of operating such an Act.

#### REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR THE YEAR 1927. BY DR. T. N. MAJUMDAR, D.P.H., D.T.M., F.C.S. (Lond.), F.R.S.E., CALCUTTA CORPORATION PRESS, 1929.

This report is very well documented and illustrated. Owing to the addition of the municipalities of Cossipore-Chitpore, Manicktolla, and Garden Reach to Calcutta city by the Calcutta Municipal Act of 1923, three sets of vital statistics are given in order that comparison may be made with former years. Greater Calcutta now covers an area of 30½ square miles, with a population of 1,077,264. The death-rate in 1927 was 34.1 per mille, calculated on the census population of 1921. As usual Entally, Beniapukur, and Tollygunge showed the highest mortalities, in all instances over 50 per mille. Entally indeed recorded a figure of 70.5, largely due to dysentery. The death-rate is much higher for females than for males, is highest among the Mahomedan community, and lowest among Europeans. March was the month of highest incidence, largely due to epidemic disease.

Infantile mortality was 339.7 per mille. The highest infant mortality occurs in the urban wards with their overcrowded buildings and congested areas. Bronchitis and broncho-pneumonia are given as the principal cause, and tetanus neonatorum accounted for 12 per cent. of the deaths. Syphilis is extremely rife and accounts for most of the premature births. A striking feature in the infant mortality is that diarrhoea and enteritis account for only 6 per cent. of the deaths; this is due to the almost universal custom of breast feeding. Infant mortality was highest in the Mahomedan community—434 per mille, and lowest in non-Asiatics and Anglo-Indians.

The birth-rate was only 15.5 per thousand of the population. Owing to the peculiar composition of the population of Calcutta, however, which contains twice as many males as females, this figure has but very little meaning. The birth-rate, as calculated on the number of women of child-bearing age, was 142 per mille. Fertility is highest among the Hindu community, and lowest among the Indian Christians.

#### PRINCIPAL DISEASES.

**Cholera** was more prevalent than usual, incidence 1.8 per mille. If the added areas be included, the figure is 2 per mille. The epidemic of 1927 followed the usual normal distribution, reaching its height in April. The riparian wards and those abutting on Tolly's Nullah were chiefly affected, as usual. The principal causes are bathing in the Hooghli and Tolly's Nullah, the use of the unfiltered water-supply for domestic purposes, contamination of food-stuffs by carriers, and flies. The seven principal bathing festivals of the year are invariably accompanied by an increase in the cholera mortality. Cases are also constantly being imported into the city and help to spread the disease. Eighty-seven per cent. of the cholera mortality occurs among the Hindu community, and mortality is highest among young children and aged persons.

**Smallpox.**—The epidemic of 1927 was severe, the total mortality being 2,860 deaths or 2.6 per mille. There have been 8 epidemics of smallpox in Calcutta during the past 30 years—an ominous record. The epidemic began, as usual, in December of the previous year, and reached its height in March (1,008 deaths); it was practically over by July. Entally, Beniapur, and Manicktola—the plague spots of Calcutta—again headed the mortality list. The incidence was 2.9 per mille amongst Hindus, and 1.6 per mille amongst Mahomedans; deaths among females were twice those among males. Dr. Majumdar is rightly emphatic about the necessity for making re-vaccination compulsory. One-third of the deaths from smallpox occurred amongst infants and children.

**Measles** was epidemic during the year, especially in the spring. Deaths numbered 108 or 0.11 per mille. Hindu infants and children were chiefly affected, and females more than males. **Enteric fever**, mortality 0.78 per mille in 1927, is always endemic in Calcutta, being prevalent in two periods, during the spring and in the autumn. The "treatment" of such patients in their own homes instead of in an infectious diseases hospital materially helps in spreading the disease. Hindus are affected much more than Mahomedans.

**Malaria**, with a death-rate of only 1.1 per mille, is unimportant in the city proper, but is prevalent in the environs. Garden Reach, for example, recorded a figure of 3.9 per mille, followed by Beniapur and Entally, both with 3.8. A "black list" is given of wards with numerous tanks, *kutcha* drains, and low-lying undrained areas. The maximum incidence is in December, but there has been an appreciable reduction in the incidence of the disease of recent years. The disease is three times as prevalent among Mahomedans as amongst Hindus, and the former community appears to be especially susceptible. "Other fevers" gave a general mortality rate of 1.9 per mille.

**Dysentery and diarrhæa** are very prominent in the returns, with a figure of 3.5 per mille. These diseases are most prevalent in the cold weather, December being the month of maximum incidence. Tollygunge, Garden Reach, Satpukur, and Entally were the wards chiefly affected. The highest mortality rates occur at the extremes of life, and females are more affected than males. Even with a protected water-supply these diseases constitute a serious problem in Calcutta.

**Tuberculosis** is apparently on the up grade in Calcutta, the figure for incidence having risen steadily from 2.4 per mille in 1921 to 2.7 in 1927. There is little seasonal variation, and almost the whole mortality is due to pulmonary tuberculosis. The root causes are poverty, indiscriminate expectoration, bad housing, and the purdah system. Mahomedans suffer more severely than

Hindus, and the saddest feature of all is the terrible incidence amongst Mahomedan purdah women of child-bearing age. An Anti-Tuberculosis Society has recently been started in Calcutta, but nothing short of re-building large areas in northern and central Calcutta will really eliminate the scourge.

**Respiratory diseases** (other than pulmonary tuberculosis) accounted for a mortality of 6.7 per mille. The highest mortality from these occurs during the cold weather, and especially affects the suburban wards which are badly drained and subject to flooding. Acute bronchitis is the chief cause of death among infants, and chronic bronchitis is especially prevalent among the aged. Females are affected more than twice as frequently as males. Influenza, as usual, was endemic.

**Kala-azar** showed a diminution, mortality 0.54 per mille. From 1917, when better methods of diagnosis and treatment were first introduced, the mortality in Calcutta from this disease increased at a tremendous rate, till it reached a peak in 1925. (This was due rather to better diagnosis and the influx of patients from the *mofussil* for the new methods of treatment at the Calcutta hospitals, than to any real epidemic spread of the disease. The years 1926 and 1927, however, showed a reduction. It is only in the more central wards of the city that the disease is endemic and is spreading, since in northern Calcutta *Phlebotomus argentipes* has every opportunity for feeding on the cow rather than on man.) The incidence of the disease in Calcutta falls with special severity on the Indian Christian and Mahomedan communities.

#### MISCELLANEOUS.

Pages 20 to 22 of the report deal with the work of the sanitary officers, and record a total of 5,199 improvement projects carried out. The total fines realized as the result of prosecutions for insanitary practices shows an appreciable rise on the figure for 1926, Rs. 60,068 as against Rs. 53,127, but the majority of offenders are simply dismissed by the magistrates with a warning—a most unsatisfactory state of affairs. Much more and much better accommodation is urgently needed for dhobi-khanas for laundry work.

A total number of 5,245 miscellaneous samples of food-stuffs was collected and examined; no less than 1,174 were found to be adulterated, or 22.3 per cent. Mustard oil especially is liable to adulteration, whilst "milk" may be anything. The work of the Co-operative Milk Societies' Union, however, deserves honourable mention. The ice and soda water factories in general were in a satisfactory condition, and are systematically inspected.

The work of the sixteen free dispensaries under the control of the Corporation was carried on as usual, whilst twenty-eight ward health associations were at work. Seven maternity centres were also working, and did much admirable work. No less than 5,280 confinements were attended to by the trained staff at these centres; the maternal mortality in these cases was only 2.2 per thousand deliveries, and the infantile mortality only 23.2 during the first ten days following birth; figures which show how immensely important this work is in Indian cities.

The number of vaccinations, 2,32,256 was greatly in excess of the figure for 1926—largely as the result of the smallpox epidemic. A very severe strain was put on the Vaccine Lymph Depot by the epidemic, and more than one and a half lakhs of tubes of glycerinated lymph were issued. Other issues were also made to medical practitioners, chemists, and to areas outside Calcutta. The success rates in different wards for primary vaccination ranged from 95.4 to 99.3 per cent., and the results are exceedingly good.

The Corporation Laboratory was in charge of Dr. T. K. Ghosh, B.A., L.M.S., F.C.S. A total of 17,170 specimens was examined, whilst the Milk Laboratory at the New Market continued its daily analysis, both morning and evening, of the milk supplies. The water-supply is tested daily; for some reason the filtered supply when

it reaches the city is less satisfactory than when it leaves the settling tanks at Pulta and Tallah; this is probably due to leakages in the distribution pipes. The "underground" problem in Calcutta indeed is rather a serious one, for main sewers and main water-supply pipes run close together—sometimes in the same bed—and three instances of contamination from this cause are given in an appendix to the report. The pressure inside the water mains is low, and the filtered water-supply is often very defective in some areas in the city, especially during the hot weather, and with water mains alongside main sewers—and in some instances actually crossing the interior of the sewer—the chances of contamination are very great. The only remedy, short of relaying the system, would be to maintain a sufficient head of pressure in the water mains to keep contamination outside. Further, underground masonry reservoirs are apt to be very unsatisfactory; they are difficult to clean and liable to cracks and fissures. A very bad example of this recently occurred at no less a place than the Calcutta School of Tropical Medicine and Hygiene, where it was found that an underground reservoir there, constructed by a contractor to the Public Works Department, was faulty and its water badly contaminated. Dr. Majumdar is of the opinion that all underground reservoirs should gradually be closed down, and their place be taken by overground tanks of galvanized iron.

The usual appendices close the report. Dr. Majumdar is to be congratulated on a year of very hard work and a most interesting report. Public health problems in Calcutta city are extremely difficult ones, and it needs an officer of both courage and ability to tackle them.

## Correspondence.

### UNDESCENDED TESTIS AS A CAUSE OF PHYSICAL REJECTION.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In the October number of the *Gazette* under the above caption Dr. Rameshwar Singh, Civil Surgeon of Muttra, writes a letter and wishes to know what the risks of this condition are, and if such cases should be rejected for enlistment or not. He also mentions that he rejected a recruit because he did not like the risk of a strangulated hernia.

Now it is presumed on his own statement that the type of case he had was of the abdominal type; and in such cases there is no fear of strangulation occurring. They are the least harmful or objectionable, but in advanced years become the seat of malignant degeneration.

The other two varieties of undescended testis are:—

(a) Femoral. (b) Inguinal.

The former (a) is most troublesome, imparts an uncomfortable feeling to the patient, often amounting to pain, and is liable to injuries from various causes too obvious to mention, and in which torsion of the cord may at any time occur, giving rise to alarming symptoms, and calling for urgent interference. The latter (b) is the most common variety and the most liable to strangulation and to the development of a strangulated hernia, due to the patency of the canal.

In the case of (a) and (b) operation is advisable to avoid the complications noted above, and also to render the patient physically fit.

In the case of the abdominal type, the question is problematical as the only complication or danger is the liability to malignant degeneration in later life.—Yours, etc.,

A. BAYLEY-DE-CASTRO,  
LIEUT., I.M.D.,

HYDERABAD, SIND,  
28th November, 1929.

### "NAGA" SORE IN RAJPUTANA.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In your issue for December 1928 there was an article by Dr. D. N. Roy, M.B., D.T.M. (Bengal), on "Naga" sore.

In August last when I returned from leave I saw many cases of peculiar ulcers in the out-patient department here, and on enquiry was told that such cases had become very common within the previous few days. I referred to Dr. Roy's article and found that these cases corresponded exactly with his description of "Naga" sore. At the time they were present here in epidemic form.

I commenced to examine the cases, and from a study of some one hundred and fifty, came to the following conclusions:—

(i) In the majority of cases the first lesions were a slight itching or scratch or some trauma. In some instances the ulcers were due to guinea-worm infection.

(ii) The ulcers were always on the leg, ankle, or foot only.

(iii) The ulcer was generally circular, its edges undermined, and its margins raised. There was a foul, purulent, tenacious slough. Lymphangitis was noticed only around the ulcer. In some cases there was a sero-sanguineous discharge from the ulcer. If left untreated, the ulcer steadily deepened and eroded more and more tissue.

(iv) On microscopical examination of the direct smears of the discharge, also of smears from the margin, the slough, and the ulcers after scraping, fusiform bacilli, spirochaetes, and diplococci were seen. The majority of cases gave positive results, though some were negative.

(v) The incidence of the disease lessened by the middle of October, though occasional cases still continued to crop up.

(vi) Some of the patients had more than one ulcer.

(vii) The ulcers were commonest among poor people and young schoolboys.

(viii) Anti-syphilitic treatment was of no avail in these cases.

(ix) I followed Dr. Hugh Smith's method of treatment, and all my cases did very well.

This experience shows that such ulcers are common, not only in Assam, but also in other parts of India, where they have escaped notice perhaps. These ulcers appear to constitute a definite clinical disease entity, and research work in connection with them is very necessary.—Yours, etc.,

MALUM SINGH B. DOSHI, M.B., B.S., B.SC.,  
Chief Medical Officer.

DUNGARPUR, RAJPUTANA,  
6th November, 1929.

(Note.—Dr. Doshi's letter raises most interesting and important problems. *Ulcus tropicum* is at present a rather badly defined entity. In the case of "Naga" sore, what is present is apparently Vincent's infection; in the case of Veldt sore of South Africa, however, and in cases described by Craig during the war from the Sinai desert, the infection present was one with diphtheroid bacilli, possibly cases of true cutaneous diphtheria. The writer remembers having seen cases exactly similar to those described by Dr. Doshi in Jhansi in the United Provinces in the monsoon periods of 1909–1911; they were especially prevalent among grass cutters attached to cavalry regiments.

The special tendency of these sores to occur only below the tubercle of the tibia suggests that the primary lesion is always of the nature of an abrasion, the *ulcus tropicum* infection being superimposed on this. We agree with our correspondent that the whole subject badly wants investigation.—Ed., I. M. G.)

### THE AGE OF CONSENT ACT.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—You have done nothing more than your duty in opening the columns of the *Indian Medical Gazette* for expression of authoritative opinion on this subject.

First of all, let me deal with religion and dogma. What atrocities have not been perpetuated all over the

world in the holy name of religion, and when has not the sanction of the scriptures been invoked, when intelligent enquiry, fairness, and equity have dictated a line of conduct and action opposed to the interests of the selfish priesthood? I claim to be as good and earnest a Hindu as anyone, and I firmly declare, first that the Hindu religion not only does not sanction early marriage, but forbids it; and, in the second place, should anyone ransack the vast Sanskrit literature to produce evidence to the contrary, I boldly assert that such "scriptures" as a Hindu have no meaning for me. Can anyone say that a man is not a good and pious Christian because he does not believe that the "sun, the moon and all the stars" were created on the sixth day?

Undoubtedly marriage is a sacrament, but early marriage goes against all the established laws of physiology. The origin of early marriage in India dates back to the time when the country, owing to foreign invasions and internecine quarrels, became unsafe and virgins were considered a lawful prey by the invaders. In ancient India no one ever thought of marrying a girl of fourteen. Do we not read how maids chose their husbands in overt assemblies of men? Bengal, the United Provinces, and Bihar were most subject to invasion and unsettled government, and in these provinces purdah and early marriage became a custom in the near past.

Early marriage prevents the girls from being properly educated. When subjected to ill-treatment child wives are incapable of self-defence. Their husbands being usually without independent means, they are generally neglected, and consequently eclampsia and sepsis—as mentioned by Col. Green-Armytage—are rampant among girl mothers. Early parenthood leads to ill-formed offspring, who, being still further unprovided for, increase the family burden of the father, who is still at school.

Interested parties will continue to raise objections, and some men, otherwise known to be calm and sedate, are liable to be taken in. Some others would raise a storm in order to come into the limelight themselves. When *suttee* was suppressed by Cornwallis, was not a storm of protest raised, and the cry made that Hinduism was in danger? But *suttee* is now no more, and Hinduism still survives. The same will be the case with this futile and puerile protest against an eminently beneficial and beneficent measure such as the Age of Consent Act.—Yours, etc.,

SHIAM MANOHOR LAL, RAI BAHADUR,  
Civil Surgeon.

JHANSI,  
20th November, 1929.

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

THE undermentioned officer is appointed Honorary Physician to the King with the Brevet rank of Colonel:—Lieut.-Col. E. C. Hodgson, D.S.O., I.M.S., *vice* Major-General Sir W. H. Ogilvie, K.B.E., C.B., C.M.G., M.B., I.M.S., from the 2nd September, 1929.

Lieut.-Col. J. L. Lunham, M.B., F.R.C.S.I., I.M.S., is appointed to officiate as Surgeon-General with the Government of Bombay, with effect from the date he assumes charge and until further orders.

Major H. J. H. Symons, M.C., I.M.S., an Agency Surgeon, on return from leave, is posted as Residency Surgeon, and ex-officio Vice-Consul, Bushire, with effect from the 8th November, 1929.

On relief by Lieut.-Col. M. S. Irani, I.M.S., Lieut.-Col. A. G. Tresidder, C.I.E., M.D. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., to officiate as Civil Surgeon, Karachi.

The services of Major A. H. Shaikh, I.M.S., are placed permanently at the disposal of the Government of the United Provinces for employment in the Jail Department, with effect from the 1st October, 1927.

Major H. K. Rowntree, M.C., I.M.S., Civil Surgeon, Simla East, is appointed to hold charge of the duties of the Civil Surgeon, Simla West, in addition to his own, during the absence on leave of Lieut.-Col. N. M. Wilson, I.M.S.

The Governor in Council is pleased to confirm Major E. E. Doyle, D.S.O., I.M.S., in his appointment of Inspector-General of Prisons, Bombay Presidency, with effect from the 14th September, 1929, *vice* Lieut.-Col. J. H. Murray, C.I.E., M.D., I.M.S., retired.

Captain T. H. Thomas, I.M.S., on return from leave, is appointed as the First Resident Surgeon, Presidency General Hospital, Calcutta, with effect from the 1st November, 1929.

### To be Captains (on probation).

Captain Robert Lewis Frost, 6th August, 1929, with seniority from 15th August, 1926.

Captain Keith Simpson Fitch, 6th August, 1929, with seniority from 13th April, 1927.

### To be Lieutenants (on probation).

William McAdam, M.B., 6th August, 1929, with seniority from 6th August, 1928.

William McCoach, B.S.C., M.B., D.P.H., 30th August, 1929, with seniority from 30th August, 1928.

Gerald Gerard Mark Davis, M.B., 6th August, 1929.

Daniel Hyacinth Waldron, M.B., 6th August, 1929.

Edmund Patrick Noel Mary Early, B.A., M.B., 6th August, 1929.

Edward Barton Eedle, M.B., 27th August, 1929.

### LEAVE.

Lieut.-Col. A. N. Dickson, I.M.S., an Agency Surgeon, is granted leave on average pay for 8 months under Fundamental Rules, with effect from the 8th November, 1929.

Lieut.-Col. F. Stevenson, I.M.S., an Agency Surgeon, is granted leave on average pay for 5 months under Fundamental Rules, with effect from the 1st November, 1929.

Lieut.-Col. I. D. Jones, I.M.S., Civil Surgeon, Karachi, is granted leave on average pay for 3 months from 13th August, 1929.

Lieut.-Col. C. R. O'Brien, I.M.S., Civil Surgeon, Dacca, is granted leave for 12 months, with effect from the 17th November, 1929, or any subsequent date on which he may avail himself of it.

In supersession of Education, Health and Lands Department Notification No. 2016-H., dated the 15th October, 1929, Lieut.-Col. N. M. Wilson, O.B.E., I.M.S., Civil Surgeon, Simla West, is granted leave on average pay for 3 months and 23 days, with effect from the 6th November, 1929, and his services are replaced at the disposal of the Government of the Punjab from the 1st March, 1930.

Major R. H. Candy, I.M.S., is granted leave on average pay for 8 months, with effect from 14th February, 1930.

### PROMOTIONS.

#### Lieutenant-Colonel to be Colonel.

Brevet-Col. Ernest Alexander Walker, M.B., F.R.C.S.E. Dated 2nd September, 1929.

#### Captains to be Majors.

S. N. Hayes, F.R.C.S. Dated 9th September, 1929.

The promotion of the undermentioned officers to the rank of Major is antedated to the dates noted against their names:—

J. C. Chukerbuti, M.B. Dated 17th August, 1927.

N. J. Gai. Dated 20th June, 1926.

J. M. R. Hennessy. Dated 21st July, 1925.

#### Lieutenant to be Captain.

Donald Page Lambert. Dated 15th October, 1929.

#### Lieutenants to be Captains (Provisional).

J. F. O. Bodman. Dated 27th September, 1929.

B. N. Hajra. Dated 10th November, 1929.

### RETIREMENTS.

The undermentioned officer is permitted to retire from the service, subject to His Majesty's approval:—

Major-General R. W. Anthony, C.I.E., M.B., F.R.C.S.E., I.M.S. Dated 5th November, 1929.

long time, there is no sign of any local inflammation. We have found the same fungus microscopically in cases of intertrigo between the toes and paronychia, see Plate II, fig. 4. Whether it is the same fungus that gives rise to all these different conditions remains to be proved by us.

*The causation of these lesions.*—For the last three years, as opportunities have arisen, we examined the first seventeen cases of this disease thoroughly by making cultures on various media and using numerous inseminations of the scales on each medium. We were able to grow a black *Aspergillus* in 12 of these cases, and a green coloured one in three cases, giving a result of 15 positive cultures for *Aspergillus* in 17 cases. At that time, we suspected that this *Aspergillus* was the cause of the lesion, owing to the black colour around the sides of the pits.

In scrapings taken from the side of these pits and cleared by 40 per cent. caustic potash, we were unable to find any hyphæ of the *Aspergillus* fungus. This was rather a blow against the *Aspergillus* theory; so we thought we would be able to prove it by studying the keratolytic action of the fungus on the epidermis of the heel. From post-mortem material the skin of the heel was first sterilised by alcohol, etc., then removed aseptically, placed on plaster of Paris platforms kept moist by water in a sterile Petri dish, and inseminated with this *Aspergillus*. The *Aspergillus* colony spread all over the skin of the heel without liquefying the epidermis. So we had to abandon this view. Later on we found that if we attempted to make cultures after allowing these patients to walk from the hospital to our laboratory, we invariably grew *Aspergilli* from their feet, as this fungus is always present in the dust of floors, etc., during the monsoon months. Last year, we realised the danger of using the caustic potash method for studying any fungi invading the glabrous skin, as it always destroys the more friable fungi like the *Malasszia*, *Actinomyces*, etc., besides producing numerous artifacts, which simulate hyphæ. We therefore no longer use it for this purpose of study. The junior author found that by using a modification of Ponder's stain by increasing the strength of the toluidin blue from 0.02 per cent. to 1 per cent. and dissolving it in 2 c.c. glacial acetic acid, 4 c.c. absolute alcohol and 93 c.c. of water, the thick bits of epidermis could be cleared in glycerine afterwards. The fungi were stained at once without any damage to the hyphæ, and the glycerine cleared the epithelial scales so that one could see through fairly thick pieces of tissue. The specimen can be examined in the wet stage with or without glycerine, a coverslip being put on if the slide has to be examined by the high power lens. These cases were studied after staining by McGuire's method, using the one-twelfth objective, and in all the eight cases recently seen we were able to find fine segmented hyphæ of an actinomycotic fungus in the scales. This method has enabled us to study more exactly these fungi

as they grow in the glabrous skin as well as in cultures, and it should be the method of choice in all work on fungi invading the glabrous skin.

*The mycology of the fungus.*—Microscopically when stained by McGuire's method the fungus is seen in the scales as very fine segmented hyphæ; these are apt to break up into individual segments, at first sight resembling bacteria, see Plate I, fig. 2. This mistake is easily rectified as the individual segments are short stout forms almost as broad as they are long. In cultures, the hyphæ are seen as a non-segmented branching mycelium, the ends of the hyphæ carrying numerous slightly stained oval conidia; see Plate I, fig. 3. In the ordinary stained specimen, i.e., fixation by heat, and staining with Manson's methylene blue, conidia are not usually found, and the mycelium consists of a network of non-segmented branching hyphæ.

These morphological appearances in cultures are exactly similar to the type culture we possess of *Actinomyces bovis* from the American Type Culture Collection.

*Cultivation.*—Out of the last eight microscopically positive cases, we have been able to cultivate an actinomycotic fungus twice. The reason of our failure has been due to the growth of certain spore-forming bacilli and an *Aspergillus* fungus. Certain precautions must be taken and the patient's foot should be thoroughly scrubbed with soap and warm water, and then washed well with sterile saline, in order to get rid of all extraneous dirt from the feet. The cultures should be made before the patient leaves his bed, after scrubbing his feet. The edges of the pit are first scraped with a fine sharp scalpel, in order to remove the black stain of the wall. Small pieces are then dug out after washing thoroughly in sterile saline and planted on whey agar medium, i.e., a medium which the senior author has used since 1906 and of the following composition, whey, 2 per cent. agar, 1 per cent. peptone, 0.2 per cent. urea and 4 per cent. saccharose. About 50 inseminations are required as any contamination prevents the growth of the fungus, for the growth is very slow, about 10–15 days must elapse before visible colonies appear on the surface of the media.

The fungus grows best under aerobic conditions, and at blood heat, 37.5°C. Within 3 to 4 days on secondary cultures visible colonies appear on the different media. The characters of the colonies on different media are as follows:—

*In ordinary peptone broth*, a flocculent white precipitate forms which falls to the bottom.

*In peptone water*, puff ball white colonies grow at the bottom and sides, the few surface colonies kept up by capillary attraction are red in colour, Plate I, fig. 4, No. 6.

*Sabouraud's media*, black or red limpet shaped colonies on the surface with deep roots into the media, Plate I, fig. 4, Nos. 1 and 2.



Fig. 2.—Objective 1/12th, ocular 10. Scrapings of the scales from the sides of the pits, and stained by McGuire's method. Note the segmented and non-segmented hyphae. The segmented hyphae look rather like chains of bacteria.

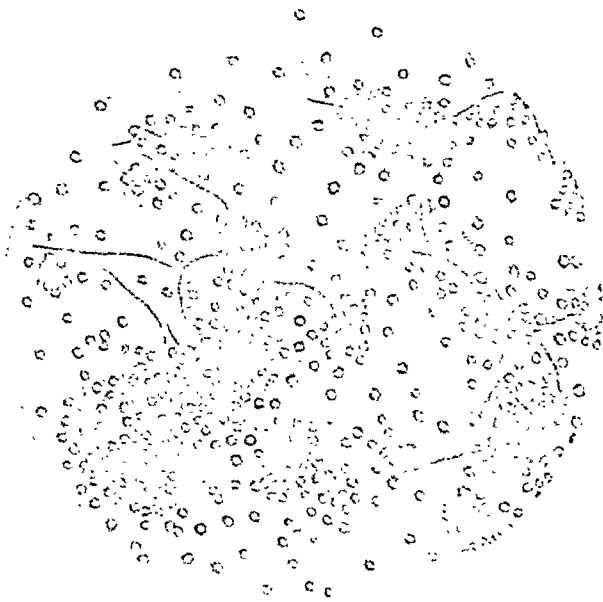


Fig. 3.—Objective 1/12th, ocular 10. Culture stained by McGuire's method. Note the non-segmented hyphae and the numerous lighter stained conidia.

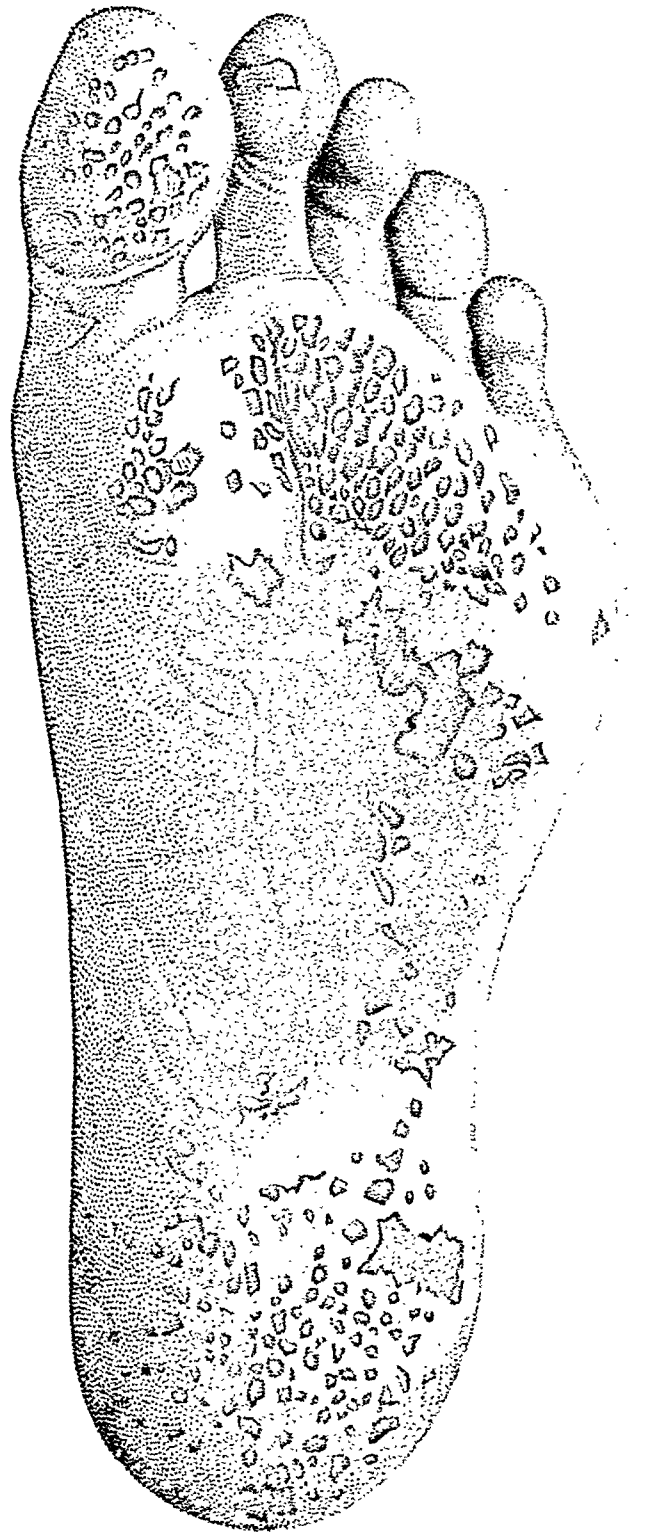


Fig. 1.—The appearance of the lesion known as keratolysis plantare sulcatum. Note the pit-like depression with darker staining of the sides.

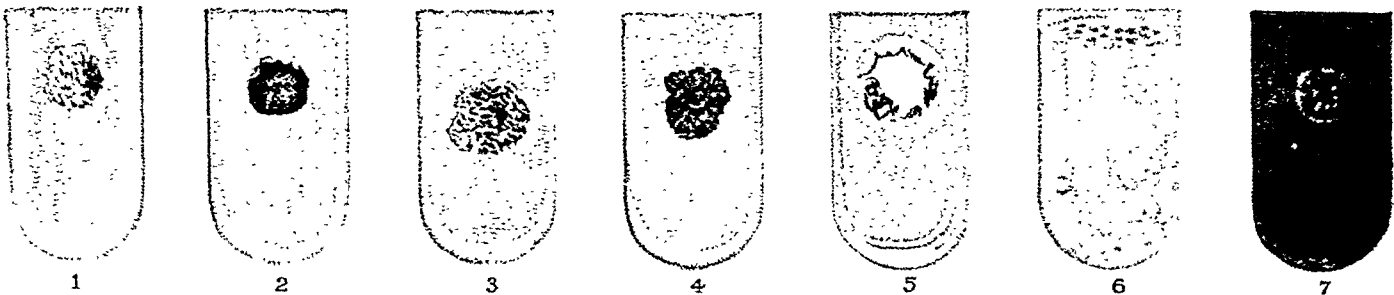


Fig. 4.—The cultural appearances on the different media. Nos. 1 and 2 Sabouraud's test media; note red and black limpet-shaped growths. Nos. 3 and 4 on whey agar, similar appearance, but more profuse growth. No. 5 coagulated serum. Note degree of liquefaction. No. 6 on peptone water. The colonies at the bottom form white puff balls and the surface colonies red. No. 7 on blood





*Whey agar*, red or black limpet shaped surface growth with deep roots, see Plate I, fig. 4, Nos. 3 and 4.

*Ordinary agar*, limpet shaped surface growth with deep roots black or red.

*Coagulated serum*.—Marked pit-like liquefaction with a small black growth at the bottom of the pit, see Plate I, fig. 4, No. 5.

*Blood agar*.—Black limpet shaped surface colony, with a small clear hæmolyzed zone round the colonies, Plate I, fig. 4, No. 7.

The cultural characters are exactly similar to the red and black fungi which we have obtained from cases of mycetoma of the foot (Madura foot).

*The value of colour as a character to identify the species of these fungi.*

We have been taught that in the clinical differentiation of these fungi, mycetomas may be classified according to the colour of their granules or growths, i.e., black, red and white, whilst the actinomyces have yellow or white granules, and very rarely red ones. Now it is obvious that there are no such colours as black or white. The former only indicates the depth of the primary colours, thus a deep red which may be so deep that it is visualised as black, and when less deep as a red, whilst when no pigment is produced the growth is achromatic or white. There are three primary colours, red, yellow, blue, and the mixtures of these give the various secondary colours, viz., orange, green, violet. So that colour value of the fungi as a differentiating character of a species can only be of value when primary colours are seen, i.e., red, yellow and blue. Thus we can have a red Mycetoma, or a yellow Actinomyces as a colour character of value to identify species. Black and white only indicate when the conditions for pigment production are favourable or totally unsuitable; compare the growth on blood agar and on peptone water, see Plate I, fig. 4, Nos. 6 and 7. The yellow colour of the agar combines with a light red to produce orange or lemon colours, as these are secondary colours. Blue with yellow produces green as is seen during the growth of the *Pseudomonas pyocyaneus*. As far as we know at present, about the genus *Actinomyces* we can only differentiate those colour values that are sufficiently characteristic to enable us to identify a species, viz.:—

(a) Those fungi that are white in colour and never produce pigment on any media used in the cultivation of these fungi.

(b) Those that are red or black in colour, in one or more of these media.

(c) Those that are yellow to lemon in colour, in one or more of these media.

When the depth of the red or blue passes into the invisible end of the visual spectrum of light, the colour must be black. As far as we know no pathological Actinomyces produces a blue pigment. Secondary colours such as orange, lemon are of no value in differentiating species.

### *Differential diagnosis.*

This has been simplified by our clinical description of these lesions, and we can confirm the diagnosis by microscopical examinations by using McGuire's stain, when the fungi can be seen in the scales. In cases of hyperkeratosis no fungi are found, and the nuclei of the horny cells are large, stain well, and have a granular appearance.

In keratolysis plantare sulcatum, the lesions are seen commonly on the thick skin of the tread of the feet, forming pits or furrows with darker sides and are due to a lysis of the horny cells. The lesions are rare on the hands. There is no localised or generalised hyperkeratosis, whilst scrapings made from the sides and stained by McGuire's method show segmented hyphæ forming the mycelium. The lesions appear during the monsoon months and disappear in the winter. There is no evidence that syphilis or yaws is a causative factor.

There are various hyperkeratoses, localised or generalised, of the palms and soles that have been mistaken for this lesion.

(1) Symmetrical hyperkeratosis of the palms and soles, known also as tylosis or mal de Meleda. The hyperkeratosis involves the whole palm and sole with immense thickening of the horny layer, and accentuating most of the furrows on the hand, so that the hands and feet cannot be extended fully, see Plate III, fig. 1.

(2) Keratoderma of the hands or feet with moderate hyperkeratosis and deep fissuring. Most of these cases are associated with special occupations; thus cultivators have lesions on the feet, i.e., cracked heels; and betel sellers, etc., on the palms. Some of these cases are due to the hyperkeratosis of syphilis, and others to ringworm, see Plate III, figs. 2 and 3.

(3) Localised plaques of keratoderma on the hands and feet. Some of these are due to ringworm and others to an Actinomyces. In many text-books they have been described as gouty eczema, etc. The fungi can be found by McGuire's method, see Plate II, fig. 2.

(4) Keratoderma cribrata (Castellani) or keratoderma punctata (Chalmers) forming localised areas of hyperkeratosis. These can be removed or fall out, leaving shallow pits as if a split seed has been lifted out of the epidermis. In India the condition is always due to syphilis, but it may also be due to yaws according to Gutierrez (1923 and 1925) see Plate III, fig. 4.

There should be no difficulty in diagnosing these different conditions of hyperkeratosis from keratolysis of the horny layer of the palms and soles of the feet. Moreover the fungus can readily be demonstrated in these cases of keratolysis.

*Treatment*.—In hospital, the condition can easily be cured by painting the lesion over with 5 per cent. formalin, as the patients have the opportunity to keep the soles of the feet dry for they are not walking about on damp soil. Prevention is possible by painting the thick skin of

the soles of the feet with 5 per cent. formalin as the fungus is very slow in growth. This could be done once a week during the monsoon months, i.e., from July to the beginning of October.

### Discussion.

Although the title of this paper deals with a single clinical lesion called keratolysis plantare sulcatum (Castellani), a lesion very common in the rural districts of Bengal, this study of its causative agent is going to yield very valuable results in the classification of the Actinomyces. The confusion that exists in the literature of Madura-mycosis is too awful for words; the following genera have been cultivated:—*Aspergillus*, *Sterigmatocystis*, *Glenospora*, *Madurella*, *Indiella*, etc. Many have been cultivated from septic sinuses, as we did when cultivating *Aspergillus nigr*a from cases of keratolysis plantare sulcatum. These fungi have been further subdivided according to the colour of the granules, black, red or white. Furthermore, slight variations in the colour and character of the growth have been considered sufficient to subdivide the genus into two separate species. Often the growth of a fungus has been accepted as proof that it is the causative organism, without testing its pathogenicity in animals. We have been able to find an Actinomyces fungus in such different lesions as keratolysis plantare sulcatum, onychia of the nail, intertrigo, hyperkeratosis of the nail bed and plaque-like lesions of the hands, similar in appearance to each other in microscopical examination by McGuire's method. Whilst the microscopical appearances of the cultures from keratolysis plantare sulcatum are identical with the *Actinomyces bovis* type culture, the culture appearances of this fungus are very like those obtained from Madura foot. The question arises whether the same fungus can produce mycetoma on deep inoculation, and keratolysis plantare sulcatum when the horny layer is macerated by dampness. Mycetoma in India is correlated with two factors, a dry sandy soil and the presence of babul thorns (*Acacia babuli*). In Bengal the soil is water-logged and suitable for rice cultivation, whilst deep injuries of the foot are not common and rarely go further than the prickle cell layer on the thick skin of the tread of the foot. The present classification of the Actinomyces adopted by Bergey is very unsatisfactory. He divides them under three heads, (a) pathogenic to man, (b) plant parasites, and (c) saprophytes. Now we know that the *Bacillus pestis*, causing rat plague, can be transmitted to man as bubonic plague, whilst the saprophytic *Staphylococcus albus* can produce superficial stich abscesses. The pathogenic Actinomyces are divided by Bergey into those that produce club-shaped ends in the tissue and those that do not do so, as well as by their growth on various media, and their pathogenicity for animals. We would suggest that the following tests should be adopted for their study.

(A) Morphology, *appearance in the tissue* as segmented or non-segmented hyphæ. The unsegmented hyphæ indicate that conditions are favourable for growth and the mycelium is young, whilst segmentation indicates age or unfavourability.

*In cultures*.—A study of young and old cultures on different media. Usually one finds unsegmented hyphæ, branching, and later on conidia. The latter may be absent if the medium is not favourable for conidia production, and difficult to see if not stained properly.

(B) Staining reactions. Examination of the fungus in the tissue as well as in culture media by McGuire's method, and also for acid-fast rods. As these are higher fixed plants, there is no need to study whether they are motile or non-motile.

(C) Cultural characters. The general characters should be first considered, whether these fungi are anaerobes, facultative anaerobes, or strict aerobes, and whether they grow best at blood heat or at room temperature. Their growth on the different media should next be studied.

(1) In fluid media, such as peptone water, ordinary peptone broth and litmus peptone broth, some fungi can form pigment from litmus, whereas they fail to do so in ordinary liquid media.

(2) On solid media—agar slopes, potato, acid and alkaline, and carrot.

(3) Solid media containing sugars—whey agar containing saccharose, Sabouraud's test medium of glucose and maltose. Most of the fungi-forming pigment do so on one or other of these media.

(4) Lytic action. The Actinomyces have a lytic action on most proteids, etc. This is of more importance than the reduction of sugars or the formation of pigment. Thus the true Actinomyces clinically do not rarefy bone or dissolve the horny layer of the skin, whilst the Maduromycosis apparently do so, hence it is necessary to study their action as regards their different enzyme action, i.e.—

(i) Proteolysis on gelatin, milk, egg and serum.

(ii) Amyolytic action on starch.

(iii) Keratolytic action on the horny layer of the epidermis.

(iv) The rarefaction of bone in culture.

(D) The pathogenic effects in animals, taking into consideration these various methods of infection on the skin surface and in the deeper tissues. Moreover we do not know whether these fungi are only infective in certain stages of their growth, i.e., by conidia, hyphæ, etc.

Moreover Pallacci and Nannizzi (1926 and 1927) have shown that for certain ringworm fungi, asci and ascospores are formed when the fungus grows at room temperature on hair, feather, leather or damp soil. In the same way, these fungi will have to be studied on media

PLATE II.



Fig. 1.—A very marked case of keratolysis plantare sulcatum. Notice the furrows on the tread of the foot.

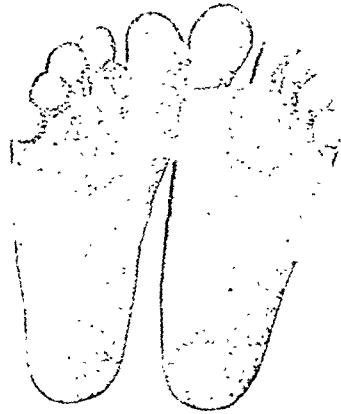


Fig. 2.—A plaque type of hyperkeratosis that showed an actinomycotic-like fungus.

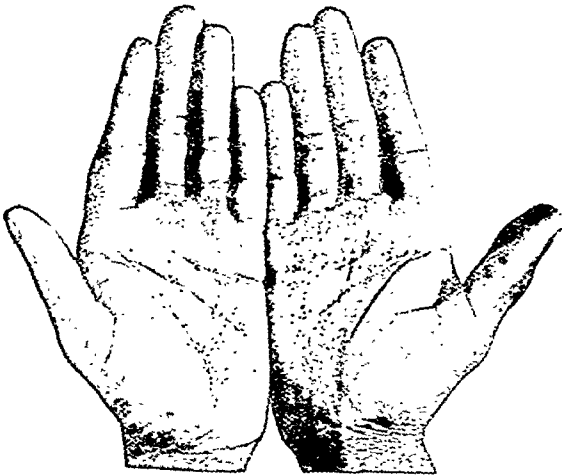


Fig. 3.—Keratolysis palmare. There are no furrows, and notice the dark staining at the sides of the pits.

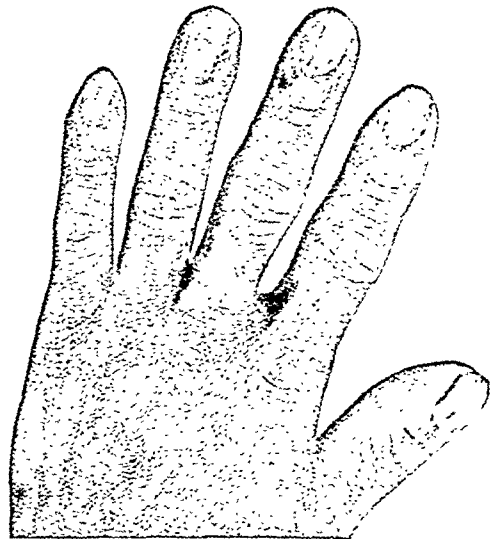


Fig. 4.—Paronychia of the nails produced by a similar fungus.

PLATE III.



Fig. 1.—Symmetrical hyperkeratosis of the hands and feet. Note the thickening of the skin and the accentuation of the main furrows.



Fig. 2.—Hyperkeratosis of the hands and feet. Secondary to ringworm and associated with certain occupations—betel sellers, cultivators, etc.



Fig. 3.—Syphilitic hyperkeratosis of the feet. Note the numerous deep cracks extending down to the prickly cell layer.



Fig. 4.—Keratoderma cribrata, a late syphilitic manifestation. Note the pit-like depressions in the centre of the palms.

other than those commonly used in the laboratory, such as thorns, etc. There is a good deal of work to be done before we can clear up the exact clinical relationship of such diverse lesions, as mycetoma, actinomycosis, keratolysis plantare sulcatum, some cases of paronychia, intertrigo, and plaque-like areas of hyperkeratosis on the palms and soles. We would be very grateful for any cultures of these fungi obtained from pathological lesions.

#### CONCLUSIONS.

(1) The lesion known as keratoma plantare sulcatum (Castellani) is not one of the hyperkeratosis, but is caused by a lysis of the horny layer of the thickened epidermis of the soles of the feet, and more rarely of the palms of the hands.

(2) The name keratolysis plantare sulcatum is a better one for describing the lesion.

(3) The lesion is not a manifestation of syphilis or yaws, but is due to an *Actinomyces*.

(4) In eight cases, examined by McGuire's method, we have found the fungus in all of them.

(5) We have obtained successful cultures in two of these cases.

(6) Microscopically, the cultures resemble the *Actinomyces bovis* of the American Type Culture Collection.

(7) The limpet shaped growth on the surface of the different media used, with deep penetrating roots, which may be black or red resembles those we have grown from cases of Madura foot.

(8) Microscopically we have found similar fungi in certain cases of intertrigo, paronychia and plaque-like hyperkeratosis on the palms and soles.

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#### ON RHEUMATIC INFECTION AS A CAUSE OF MITRAL STENOSIS AMONGST YOUNG INDIANS.

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Does acute rheumatic arthritis affect Indians?  
 Is unrecognized subacute rheumatic infection in childhood responsible for the mitral stenosis and

chronic congestive heart failure of young Indian adults?

My interest in these questions was first aroused by observing a series of some 20 cases of chronic heart failure in young Indian males, mostly between 12 and 18 years of age, in the medical wards of King George's Medical College Hospital, Lucknow, during the past seven years. They were the victims of congested heart failure following progressive stenosis of the mitral valve. What was the cause of this chronic mitral fibrosis? Was it an evidence of subacute rheumatic infection during childhood? Before this problem could be decided, the question as to whether rheumatic fever exists amongst Indians at all required consideration.

*Former views.*—The impression formerly held was that Indians were not susceptible to rheumatic fever. Authorities who had examined the cause of chronic valvular disease amongst young Indian adults had concluded that the chronic valvular disease affecting them was a sequel of preceding pneumococcal or streptococcal inflammation. Moreover it was an impression amongst those who had given a thought to the world distribution of rheumatic fever that rheumatic infection would not, in general, exist in such warm climates as in India, Africa, and especially in Egypt. So far as was then known it was confined mainly to such cold and damp climates as are typically experienced especially during the autumn and also during the spring of the British Isles—and of the coast line of North Western Europe.

But acute articular rheumatic fever does affect young Indian adults. I use the word "articular" because an acute febrile infection with multiple hot red swollen joints, exquisitely painful, and affected in rapid sequence, in a young adult, in whom other causes of acute synovitis have been excluded, and when the infection has often followed exposure to cold and damp and has responded to rest and salicylates, forms a clinical syndrome the significance of which is quite clear. I have in mind three such cases in young Indian adults where such a pathognomonic picture was typical. Moreover one of these cases was observed in hospital to develop rheumatic pericarditis and another rheumatic mitral endocarditis. In one case the patient had been soaked in the monsoon rain and had slept on the sodden earth throughout a night preceding his attack. I have seen further cases where a diagnosis of acute articular rheumatic fever was justified, but in these three cases there could be no dispute as to the undoubted evidence they afforded of the existence of acute articular rheumatic infection in young Indian adults. Lieut.-Col. Sandes, I.M.S., Physician to the Medical College Hospital, Calcutta, tells me he frequently recognizes acute rheumatic infection in Indians in his wards. The answer to our first problem is therefore that acute arthritic rheumatic infection does attack young Indian adults.



*The subacute rheumatic infection of children in England. The difficulty attending its diagnosis. The frequency with which it terminates in mitral stenosis.*

Acute rheumatic fever with well marked synovitis in young adults is an easily recognizable disease. It is, however, far different when subacute rheumatic infection attacks young children, for at this age the infection is most insidious in its onset, the synovia of joints frequently escape or are only slightly affected, and the attack concentrates on such fibrous structures as tendons, fasciæ, ligaments, producing often ill-defined "growing" pains in the joints and limbs. The most characteristic, the most common, and the most dangerous fibrous tissue structure to be attacked by the rheumatic toxin in childhood is that of the mitral valve. Rheumatic myocarditis and pericarditis may occur, but the typical lesion is mitral endocarditis. So common indeed is this association and in order to stress the importance of the usual localization of the permanent lesion in the subacute rheumatism of children that the initial diagnosis of rheumatic carditis is often made instead of the more general diagnosis of rheumatic fever when the infection attacks children. The mitral stenosis shows itself by clinical signs and symptoms some five years after the period of infection, that is usually about or soon after the age of twelve. Then there is no evidence of active infection and at a variable time later the patient is admitted to hospital with irreparable advanced mitral disease and congestive heart failure. Mitral stenosis also frequently follows the articular type of rheumatic fever of young adults.

Of all cases of mitral stenosis in England some 80 or 90 per cent. give a history of previous rheumatism. It is probable that in the great majority, if not all, of the remaining cases, the symptoms of the mitral rheumatic infection in early life were so insidious and so slight as to be entirely overlooked or regarded as due to some trivial ailment. Thus, even in England, where both parents and doctors are alive to the existence and seriousness of the condition, such subacute rheumatic infection of early childhood escapes recognition. It is therefore easily understandable that in India these cases have not yet been generally recognized. And this is the more so since, as is well known, rheumatic fever affects mainly the poorer classes and not those of the well-to-do, whose children naturally come under more careful observation.

*Unrecognized subacute rheumatic infection in childhood is the probable cause of mitral stenosis in young Indian adults.*

In England rheumatism in childhood is the cause of mitral stenosis. With the knowledge that acute articular rheumatic infection attacks young Indian adults and with the knowledge that mitral stenosis is far from uncommon amongst Indians in their early teens, it is extremely probable (provided other possible causes

for mitral stenosis have been considered and excluded, see following paragraphs)—that subacute rheumatic infection is not uncommon amongst Indian children, and that owing to the vagueness, insidiousness, and slight degree of the initial symptoms, and owing to the class of patient typically affected, the disease has so far in general been overlooked.

*Review of other possible causes of mitral stenosis.*

Before the presumption that unrecognized subacute rheumatic infection in childhood is the cause of mitral stenosis in young Indian adults can be allowed to stand, other possible causes of mitral stenosis must come under review. Such causes may be conveniently considered under the heads (a) congenital abnormality, (b) degenerative disease, (c) infections—streptococcal, pneumococcal, scarlet fever, influenza, and syphilis.

(a) *Congenital abnormality*.—Congenital heart disease in general produces a clinical picture in which the child is stunted in physical and in mental development, with an enfeebled circulation and such signs of chronic stasis as clubbed fingers. Congenital heart disease is recognized at an earlier age period than the cases of mitral stenosis which occur about puberty. Moreover congenital disease commonly affects the pulmonary valve. The mitral valve is very rarely affected. I have not seen a case, either clinically or at post-mortem. It is of interest to note that French physicians in general consider that mitral stenosis of young women may be of congenital origin, a view which British physicians regard with scepticism.

(b) *Degenerative disease*.—Valvular disease from cardio-vascular degeneration nearly always affects the aortic and rarely the mitral valve, except as a secondary and mechanical extension. Moreover cardiovascular degeneration develops in persons over 40 and not in the age period at present under consideration.

(c) *Streptococcal infection*.—In the literature on mitral disease, the possibility of mitral sclerosis arising after such acute infections as streptococcal septicæmia, pneumonia, scarlet fever, or influenza receives recognition. Certainly the streptococcal group does give rise to an acute or subacute valvular endocarditis, but this is a progressive endocarditis of a malignant type, terminating it may be after a year or so in a fatal issue. The illness is liable to be still more acute and malignant if the infecting organism is a staphylococcus.

*Pneumococcal infection*.—The pneumococcus does give rise to an acute valvulitis with vegetations. It is just possible that such a case might progress to chronic valvular disease, but the evidence for this is by no means certain; pneumococcal endocarditis is in general a fatal disease. If the pneumococcus were at all a usual cause of valvular endocarditis one would expect to observe this condition develop after the severe and frequent cases of lobar pneumonia and of pneumococcal septicæmia one sees in young

adults. I have not yet observed this occur clinically; though it does undoubtedly occur, yet it is by no means common. Moreover a preceding history of so definite and so acute a disease as lobar pneumonia would be easier to obtain than the vague symptoms associated with sub-acute rheumatic infection of childhood and if pneumonia were at all a common antecedent of mitral stenosis, its history would not be readily overlooked.

*Scarlet fever.*—As regards scarlet fever the view of some physicians of wide experience in infectious fever hospitals is gaining ground that when permanent valvular disease develops after scarlet fever it is probably an evidence of preceding or of concomitant rheumatic infection. Moreover it has yet to be shown that scarlet fever exists at all amongst Indians.

*Influenza.*—There is no proof that influenza gives rise to a valvulitis, though it certainly produces an acute myocarditis in the same way as the diphtheritic and to a far less degree the enteric toxin does. If the influenza toxin produces mitral stenosis, it would do so by causing a progressive fibrosis of the mitral ring itself, but there is no evidence that this occurs.

*Syphilis.*—As syphilis is so frequent a cause of fibrosis, especially in the cardio-vascular system, I have re-considered the possibility of congenital or of acquired syphilis being a cause of mitral stenosis with special care. Apart from some rare pathological curiosity such as a gumma obstructing the mitral orifice (which I have myself seen in a post-mortem heart) the literature does not recognize syphilis as a cause of mitral stenosis. Aortic regurgitation is of course a common and clearly proved sequela of vascular syphilis, but mitral stenosis does not develop in the age period in which the effects of vascular syphilis becomes obvious.

As regards congenital syphilis, it has been uniformly outside the experience of the cardiologists and of syphilologists with whom I have discussed this point that congenital syphilis is a recognized cause of mitral disease in the young. Even Professor Warthin of Michigan University, U. S. A., who has done so large an amount of original work on cardiac syphilis, and is so enthusiastic in his findings of the frequency of syphilis as a cause of cardiac disease, told me that he had never seen a case of mitral stenosis which he regarded as due to syphilitic infection. Moreover in my own wards and in those of my colleagues at King George's Medical College I have examined a series of some 20 cases of mitral stenosis without finding any clinical signs of syphilitic stigmata in them. A Wassermann test of their blood sera showed only one positive in twenty examinations.

*Conclusion, with a note on world distribution.*

The generally accepted view that syphilis, whether acquired or congenital, is not a cause of mitral stenosis is upheld. Moreover my own

experience and the impression gained from conversation with many cardiologists coincide in indicating that mitral stenosis of long standing is a most unusual sequela, even if it ever occurs, of such infections as with streptococci, pneumococci, scarlet fever or influenza. Degenerative disease is not a cause of mitral stenosis, nor is there sufficient evidence to assign this lesion to a congenital defect. There is then nothing in an examination of the other possible causes of mitral stenosis which weighs against the probability of unrecognized sub-acute rheumatic infection amongst Indian children being the great cause of mitral stenosis in young Indian adults.

As regards the world distribution of rheumatic fever it would certainly appear commonest in the British Isles. It is certainly far more uncommon in those parts of India that I know than in England. Medical men from Canada, the U. S. A., South Africa and Australia have told me that it is relatively rare in those areas as compared with Great Britain. It is certainly common in Belgium and apparently rare in Egypt, which after all what one would be led to expect.

#### SOME SAFEGUARDS AND POINTS OF TECHNIQUE IN THE EXTRACTION OF SENILE CATARACT WITH CAPSULOTOMY.

By M. D. ANKLESARIA, D.O.S.M. (Eng.),

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It ought to be the rightful ambition of all ophthalmic surgeons to secure the highest percentage of success in the extraction of senile cataract both as to quality and quantity. Considering the fact that the eye is a highly evolved and extremely delicate organ, and restoration of vision as near the normal as possible our sole object, in dealing with it no precaution or detail is too trivial and no care or precision too much. While this paper claims nothing original or new, nothing that has not been said elsewhere, it claims the necessity of recording in these columns safeguards and modification of technique abundantly tried and found successful, in the hope that wider publicity may result in greater benefit to the blind.

*Preparation of the patient.*—General cleanliness of the body as a whole and of the head and face in particular should be enjoined. Oral sepsis, septic tonsils, and toxæmia from the alimentary and genito-urinary tracts form important sources and predisposing factors of endogenous infection and should deserve our careful consideration. Oral sepsis may be due to inflamed gums, stomatitis and ulcerations of various forms, caries of teeth and decayed stumps, dental or apical abscesses, pyorrhœa and general want of cleanliness of the teeth, and

should be suitably dealt with before the operation. To keep the mouth as clean as possible, a routine use of mild antiseptic gargles such as of weak potassium permanganate lotion should be prescribed twice or thrice daily for the whole course of treatment. Diseases of the nose and the accessory sinuses should be treated beforehand. Atrophic rhinitis, a very frequently neglected form of ozæna, should not be lightly considered but should be treated first with a little iodine paint applied to the nostrils once or twice daily for a few days before and during the course of operation. A gouty diathesis is more apt to cause severe iritis after the operation. The presence of albumin or sugar in the urine is a matter of great anxiety to the operator. These conditions not only impair the healing power of the wound, but cause serious complications such as severe iritis and cyclitis with exudation which mar the success of the operation. On the other hand both these conditions can be made amenable to a proper regulation of diet and suitable drugs before the operation, and during the course of the after-treatment in order to tide over the period of complications. Numerous eyes have been lost for want of observance of this elementary precaution. In case of syphilis it is always advisable to have some anti-syphilitic treatment carried out prior to operation for fear of a severe iritis resulting later on. Patients with high blood pressure, also big burly individuals with short thick necks are losing hazards and should be accepted with caution. In such cases a course of thyroid gland for a few days previous to operation would be good. The bowels should be thoroughly evacuated the previous day, to avoid getting up on the day of the operation.

A great measure of success depends upon the proper and judicious selection of cases. All cases of inflammatory processes beyond those caused by traumatism due to the operation can now be safely attributed to infection from the conjunctival or the lacrimal sac, both of which are important habitats of microbic population, and hence the commonest sources of exogenous infection to which are due the majority of our failures to restore the sight. To the extent that this is preventable the responsibility is ours.

With our modern methods of high pressure sterilisation of dressings and thorough sterilisation of instruments chances of infection from these sources are practically non-existent. As the conjunctiva is seldom free from pathogenic germs, a bacteriological examination of the conjunctival sac as a safeguard should be most desirable wherever possible as a routine method, though unfortunately it is not available to us as yet. A few white staphylococci or xerosis bacilli of low pathogenicity may not matter, but *Staphylococcus aureus* or *citreus* or streptococci or pneumococci or ozæna bacilli are all contraindicated for an operation. When such an examination is not available slight hyperæmia or very little thickening of the conjunctiva or the

presence of mucous or a muco-purulent discharge at the inner canthus, so often seen in the case of patients who have had trachoma, should forewarn against operation. The absence of movements of the lids and the diminished lacrimation when under a bandage and the rise in temperature and increase in the congestion of the conjunctiva consequent upon closing the lids and traumatism are all favourable factors for an increase in the existing microbic population, aggravate their virulence and harmful effects, and give rise to infective process of varying degrees which eventually prolong the convalescence and mar the success of the operation to a greater or less extent.

As further safeguards against infection the lacrimal sac should be carefully examined for any regurgitation or discharge of mucous or muco-pus. But this is not enough. The patency of the nasal duct should be established beyond doubt in all cases by syringing and noticing a free passage of fluid in the nose or by putting a little fluorescein solution or argyrol or mercurochrome drops at the inner canthus and then asking the patient to blow the nose after a little while and noting whether the secretion is stained or not, I prefer to instil mild antiseptic drops of mercurochrome gr. 2 to oz. 1 twice daily until the time of operation.

For those patients who are very nervous a dose containing bromide, morphia and chloral should be prescribed as a routine one hour before the operation to allay their irritability. A little time wasted on training the patient to look up and down as directed without moving the head and to gently close the eye when directed to do so is always well spent.

*Preparation of the eye.*—The face should be well washed with soap and water. The anaesthesia is carried out by instillation of 3 or 4 drops of a freshly prepared and sterilised solution of cocaine 4 per cent. and adrenalin m. 2 to 1 c.c., four such instillations being put in the eye to be operated at five minute intervals, and twice in the other eye, both being kept closed. After the first instillation of cocaine and adrenalin the lids are everted and the conjunctival sac, including the fornices, the caruncle and the margins of both the lids, thoroughly exposed and washed out with hydrarg. perchloride lotion 1 in 5000, the contents of a 4 ozs. undine. The importance of irrigation of the conjunctival sac with perchloride of mercury lotion, advocated by Herbert so far back as twenty-five years ago as an important safeguard against infection, remains unchallenged even to-day, owing to the average Indian conjunctiva being far from the normal. Its action is partly mechanical and partly chemical, owing to its coagulative action in which are imprisoned the organisms of the superficial epithelium of the conjunctiva, these latter being removed by the subsequent swabbing with cotton-wool wetted with normal saline lotion. The margins of the lids should be

emptied of the meibomian secretion and the eyelashes of the upper lid, particularly of the outer half, should be cut short. Tincture of iodine should be applied externally over the eyelids and their vicinity. The beginning of the dilatation of the pupil is the signal that the cocaine has acted on the iris and the anæsthesia is complete.

Over and above this instillation anæsthesia, by far the most important safeguard against those who show a tendency to squeeze their eyelids violently or who cannot control their twitchings is an injection of novocaine and adrenalin into the orbicularis oculi muscle with the double object of securing a palpebral akinesis or a temporary paralysis by blocking its motor supply, the zygomatic branches of the facial nerve, and also an anæsthesia of the lids and the canthi by blocking their sensory supply from the lacrimal, the supraorbital, the supratrochlear and the infratrochlear branches of the ophthalmic for the upper lid and the infraorbital branch of the maxillary division of the fifth nerve for the lower lid, after the method of Van Lint of Brussels. About 3 or 4 c.c. in all of a one per cent. novocaine solution containing 1 minim per c.c. of adrenalin solution 1 in 1000 may be injected by inserting the needle at the point of intersection of two lines, one a horizontal line passing 0.5 cm. below the lower border of the orbit and the other a vertical line passing 0.5 cm. external to the outer margin of the orbit. The needle penetrates skin and muscle down to the bone and is pushed towards the horizontal line, and about one-third of the solution is injected drop by drop, the needle keeping close to the bone. The second-third of the same solution is injected in the vertical line close to the external orbital border in two or three spots, and the final third is injected close to the superior orbital border in two or three spots, but more or less superficially. In about 10 minutes the lids will relax sufficiently or become sufficiently weakened so as not to disturb the operation and will remain so for about 30 minutes more. Another little suggestion to overcome this squeezing tendency is to ask the patient to keep his mouth open and breathe through it, as with an open mouth he will not squeeze so hard.

The *bête noire* of all operators who perform extraction with capsulotomy is usually inflammatory processes varying in number and severity, partly due to the traumatism inflicted, partly due to bacterial infection, and partly due to irritation caused by the particles of lens matter left behind. To inhibit these factors, if not to check them altogether, various modifications of technique were introduced. Subconjunctival extraction was advocated as early as 1855 by Desmarres, in 1898 by Pansier, in 1899 by Vacher and in 1903 by Czermak in different forms. More recently this method has been advocated by MacGillivray, Cridland, Killick, and others. The addition of a conjunctival flap was the first step in that direction and its

subsequent conversion to the bridge by keeping the flap undivided and attached to the bulbar conjunctiva was a more effective and ambitious advance on the original. The best way we have found to effectively control them to some extent is by performing the extraction under a conjunctival bridge which causes an immediate sealing of the wound, and by as completely washing out all lens matter as possible from the anterior chamber by irrigating it with saline lotion.

Many may not regard it as good surgery to make such a large section in the avascular cornea and allow it to remain open and in contact with the palpebral conjunctiva, which is by no means sterile. The slight gaping of the wound that may take place about its middle or the top of the arch is liable to be infected by contact with it and aggravated by partially uncontrolled vertical movements of the upper lid. To this the conjunctival bridge affords the most suitable protection by the immediate sealing of the wound it causes. Further, owing to the conjunctiva being intact and the vessels undivided at the bridge, the nourishment of the anterior lip of the wound is unimpaired and hence inflammatory complications of the cornea are of rare occurrence and healing takes place sooner, thus materially reducing the course of the after-treatment, a no small gain indeed. The anterior chamber can also be irrigated with a feeling of security under the protection accorded by the conjunctival bridge, there being no gaping wound and dread of loss of vitreous at any moment. It provides a further safeguard against the over-riding of the edges and the eversion of the flap. The anterior chamber soon becomes restored, a decided advantage, as atropine will not act until it becomes formed. Prolapse of the iris or tags of capsule, if any, are effectively covered over, keratitis of any degree of severity is the exception, and post-operative astigmatism is not above the average.

Among the disadvantages of the bridge must be mentioned the fact that in the first place it is a little difficult of execution and it is also sometimes impaired by consciousness, i.e., when you wish to do it best you often fail to do it. With regard to bleeding at the time of operation the addition of a little adrenalin to the cocaine checks it, and owing to the position of the bridge what little occurs passes out of rather than inside the anterior chamber and there is no increased tendency to bleeding during the after-course unless due to trauma. The performance of the iridectomy and particularly the delivery of the lens gives real trouble if the bridge is not sufficiently long. I had it in my earlier cases, but since I hit upon the plan of causing the edge of the lens to get fixed on the side of the incision towards the iridectomy and of using the point of the von Graefe knife to stab and lift the lens out of the wound that difficulty has ceased to exist. I have tried this method in a large number of cases in the past several years and found it most successful for extractions

with capsulotomy. Much has been said for and against the bridge in the last few years by men whose opinion is entitled to great respect. My experience however leads me to recommend the bridge and I have therefore ventured to express my views with considerable diffidence.

*Incision with a conjunctival bridge.*—A small incision spells disaster. It is apt to cause trouble in numerous ways. Undue force has to be used in the delivery of the lens, bruising the edges of the wound and causing a large amount of cortical matter to be left inside and stripe keratitis likely to result therefrom. A liberal sized incision should be the rule. The patient should be asked to look down as far as possible. The incision should be made with a von Graefe knife so as to carry a small fold of conjunctiva at the puncture and the counter puncture and carried into the corneo-scleral margin above, and then prolonged underneath the conjunctiva as far back as possible and left undivided, there to form a fairly broad bridge of intact conjunctiva above. This is difficult when the lids are narrow and the eye lies deep in the socket, in which case the bridge may be lengthened upwards by means of scissors cutting on either side and equally. It is necessary that the bridge should be long and even on both sides. Owing to the use of adrenalin in cocaine and the conjunctival vessels being left undivided, little hæmorrhage occurs if any.

*Iridectomy.*—The main purpose of the iridectomy is to prevent a prolapse of the iris by the gushing aqueous after the operation, whilst owing to the conjunctival bridge a small peripheral iridectomy after the extraction is impossible. A complete iridectomy is to be preferred in this also that it permits the use of capsule forceps to tear out as large a piece of the anterior capsule as possible. Owing to the conjunctival bridge the iridectomy has to be made a little to the outer or inner side of 12 o'clock.

*Capsulotomy.*—I always use a capsule forceps, preferably with many teeth, except in Morgagnian cataracts which are punctured with the point of the knife. The closed forceps are passed into the anterior chamber and are gently opened and lightly pressed upon the anterior capsule to obtain as big a bite of it as possible, and with gentle side to side movements it is torn out of the wound. By removing a good sized piece of the anterior capsule of the lens a wide opening is made for removal of the cataract and the evacuation of the remaining lens matter is favoured.

*Delivery of the lens.*—The conjunctival bridge causes a certain amount of difficulty in the delivery of the lens and is hence an important cause of annoyance to many. I tackle it easily with the spoon and the von Graefe knife. With the spoon in the left hand pressure is applied over the lower and inner part of the edge of the lens, and with the back of the knife near its point, the upper and outer lip of the wound is depressed and the edge of the lens is

made to engage in it and kept steadied there by the lower spoon. The knife is now used as a lance to rotate the edge of the lens towards the puncture and stab and lift it out of the wound. The anterior chamber is then irrigated with the nozzle of a small cannula attached to a flask containing 0.6 per cent. sterilised saline by means of a rubber tubing. If one dresses one's own cases one cannot fail to be struck by the comparative freedom from inflammatory changes in cases in which the anterior chamber was clear from the first, as shown in cases of Morgagnian cataracts, and by the severe reaction displayed by those where much lens debris remained in spite of washing out. Though this latter method has not found favour with surgeons in the West, I have no manner of doubt about its efficiency and harmlessness. As complete evacuation of cortical matter as possible should be the dictum to follow and can be accomplished with impunity under the protection accomplished by the conjunctival bridge. All lens debris behind the iris and situated at the periphery should be coaxed towards the pupillary area by gentle stroking movements made on the cornea and at the periphery with the bend of the spatula or by the back of the spoon and then washed out of the anterior chamber by the gentle stream from the cannula of the irrigator. The stream from the irrigator running in the anterior chamber is regulated by the finger tips and thumb holding the rubber tube over the cannula. By alternately pressing and relaxing the rubber tubing, i.e., making and breaking the current or playing it in a side to side fashion or depressing the lower lip of the wound all lens debris and blood, if any, is successfully washed out. A little patience and care in this step of the operation is always well spent, as can be judged from the comparative freedom from injection and infective complications to which such eyes are subject. On the contrary blood clot and lens debris form good culture medium for organisms of low virulence to grow, and, with the traumatism, favour fibroblastic activity and proliferation of epithelial cells, and infective processes of varying degrees develop and iritis and exudation result therefrom. Careful reposition of the pillars of the iris is a very important safeguard against incarceration or prolapse of the iris, which though slight in degree are serious enough for the ultimate fate of the operated on eye. The wound in such cases takes a long time to heal and does not become firm, the pain and irritation in the eye is kept up indefinitely and the cicatrix may become ecstasic. Secondary glaucoma or late infection may occur, or sympathetic trouble may develop in the other eye. The edges of the wound should further be cleared so that no intraocular content such as a tag of capsule or cortical matter or vitreous may get entangled in the wound and prevent its early union. Delayed union and late formation of the anterior chamber and infection are apt to result from such causes. The aqueous keeps on escaping

continuously through a small fistula at some point in the wound, and contact keratitis develops owing to the anterior chamber long remaining unfilled.

After the completion of the operation it is advisable to instill 2 or 3 drops of a one per cent. sterilised atropine solution so as to open up the pupil early enough to prevent synechiæ forming, and if the pupil is not dilated the next day, atropine should be put twice or thrice watching its toxic effects. Both eyes are bandaged and the unoperated on eye is kept open after the anterior chamber has formed in the operated on eye. The patient begins to feel some pain after the anæsthetic effect of the cocaine has passed away, due to the contact of the iris with the cornea, but it disappears as soon as the anterior chamber becomes restored. The dressing should be changed daily and any mucus over the lid margins carefully cleaned and 2 or 3 drops of atropine, 1 per cent. should be continued till all trace of ciliary injection has disappeared.

If there is much catarrh of the conjunctiva, mercurochrome 1 per cent. or argyrol 10 per cent., or zinc drops gr. 2 to oz. 1 may also be instilled. The edges of the wound should be carefully examined to see that no infection has started there. In all suspicious cases parenteric injections of sterilised milk 8 to 10 c.c. may be given in the gluteal region which nearly always check the pyogenic process like a charm.

### ARS GYNÆCOLOGICA.

By V. B. GREEN-ARMYTAGE, M.D., F.R.C.P. (Lond.)

LIEUTENANT-COLONEL, I.M.S.,

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**Operative results.**—Polak in a very interesting paper has analysed 95 deaths out of a total of 3,125 patients operated upon. He considers that the fatal issue can be attributed to one of the following causes:—

(a) Employment of the high Trendelenburg position in a patient with high blood pressure produces cardiac embarrassment, and the prolongation of this posture in patients with low blood pressure increases the occurrence rate of shock. This information is of particular importance to us in India.

(b) Too much surgery has been done at one sitting.

(c) The time consumed in operating has overreached the maximum of safety.

(d) Forty-eight hours' rest is imperative before any major operation. This rule is frequently disregarded in India.

(e) Patients who have been the subject of prolonged infection and have either a high or low leucocyte count, and particularly a low polymorphonuclear count, have a poor reaction to operative procedure. The optimum leucocyte count is 7 to 10 thousand, and the optimum polymorphonuclear percentage is 65 to 80.

He lays stress on the importance of every patient taking not less than three quarts of fluid (water, milk, fruit juice) per day for 2 to 3 days before operation, and considers that during this period the usual cane sugar intake of the individual must be quadrupled. This latter statement is of interest to the writer, for he has during many years insisted on all patients about to undergo major operations, taking 3 to 4 ozs. of natural honey (*modhu*) for 5 to 7 days before operation in order to increase the liver glycogen reserve, and inhibit the risks of acidosis and shock, and his results have justified the procedure now advocated by Professor Polak.

It is interesting to observe that 8 of the deaths recorded were due to paralytic ileus. Such ileus is due to partial obstruction, for although there may be a passage of gas from the rectum, and even bowel movement, vomiting continues and the gas tympanites quickly re-accumulates.

In such cases the pulse and temperature are not much alleviated, yet regurgitant vomiting continues and gas pains persist. The only treatment is early exploration under local anæsthesia, when it will be revealed that there is some loop of the intestine slightly adherent to the abdominal wall or to a point in the operative field. Release of this, with or without puncture enterostomy, or cæcostomy, will save the majority of these patients if only the surgeon has the courage to do so immediately a clinical diagnosis is made. Professor Polak is definitely against operation in the acute or sub-acute stages of adnexal infection. Should operation, however, become imperative because of pus formation, or obstructive peritonitis, he advocates only simple drainage from above or below.

**Sterility.**—During the last year, several papers of importance have appeared on this subject, so perhaps it will be useful to refer to conditions which are common but are rarely understood by the general practitioner, who is as a rule the first person to be consulted on this matter.

For instance, under-development of the uterus is a much more frequent cause of sterility than is generally supposed, but it must be remembered that there are minor degrees of under-development, which though unfavourable are not hopeless. For an under sized uterus associated with infrequent and scanty menstruation may represent a delayed rather than an arrested development. In such a case the stimulus of marriage is probably the most successful treatment, but as I have previously pointed out, growth and function may be assisted by the administration of thyroid gland, half a grain twice a day for twelve weeks.

Pituitary, ovary and corpus luteum extracts are useless by the mouth; if they can be given hypodermically, from freshly prepared sheep's ovary, they may have some value.

Progressive or pronounced obesity is antagonistic to reproductive activity, but fat sterile women can become pregnant if their adiposity can be reduced. I have seen quite a number of such fat cases where fertility has occurred follow-



ing prolonged illness with high fever. For instance after enteric, malignant malaria and kala-azar, the adipose tissue is burnt off, so to speak, and the uterine function rejuvenates. In this connection it is not without interest to quote a few references from Shakespeare; for instance you will remember Dr. Cerimon in *Pericles* says—

"Who can speak of the disturbances that Nature works, and of her cures."

And the lines in "*All's Well That Ends Well*"

"Our remedies oft in ourselves do lie,  
Which we ascribe to Heaven."

When I am consulted for sterility by a patient who is unduly stout, I always advise as a first step, reduction of weight, not so much by the omission of this or that article of diet, as by diminution of the total amount of food taken, supplemented if necessary by the administration of thyroid gland and protein shock therapy which enhances the rate of fat metabolism.

It should be remembered that early-marriage-contraceptive-measures, if continued for any length of time, are inimical to pregnancy. Oft repeated and constant coitus induces a condition of hyperplasia of the ovary, and what has been called by the undignified name of the "*Marie Stopes' uterus*." In such a case of sterility it is only fair to the patient for the practitioner to make enquiry and advise accordingly; for it has been discovered that less than 20 per cent. of women who use contraceptive measures for a consecutive period of three years ever become pregnant.

Artificial insemination, though not a very pleasant business, has its uses for cases where the act of coitus is difficult or unsatisfactory, for many reasons which I need not go into here. If the semen is positive, success may occur. The husband is put in one room and the wife in another. She is placed in the lithotomy position with a speculum in situ and a tenaculum on the cervix. Directly the semen is received into a warm test-tube, it is aspirated into a glass syringe fitted with a four-inch soft rubber catheter which is then carried into the adjoining room, inserted into the cervix above the level of the internal os and slowly injected into the uterus. This procedure is adopted on the fifth, eighth and eleventh days after the last day of the menstrual period.

It is possible that some cases of sterility are due to a plug of mucus which blocks the cervical canal, and so prevents entrance of the spermatozoa; in such cases insemination is useful as the nozzle of the rubber catheter passes through and above this plug into the cavity of the uterus. Some gynaecologists, recognizing the importance of eliminating this mucus plug from the cervix, insist on every patient using prior to coitus, a douche of 2 per cent. bicarbonate of soda in warm water.

If the external os is unduly contracted or of the pin hole type, dilatation should be done, but without laceration. In cases of one child sterility, or of abortion, and no child, it is common to

find a flabby patulous external os. For these striate electric cauterisation is useful.

For many years now we have been using the Rubin insufflation test, which, apart from its diagnostic importance, has a therapeutic value of at least 10 per cent. Recently, however, a new therapeutic method has come to the fore which has even greater therapeutic and diagnostic value. I refer to the use of lipiodol.

Forsdike uses a Record syringe, but I use Statham's modification of Becler's instrument. If lipiodol is used diagnostically an x-ray photograph should be taken or fluoroscopy done at the time, or within 24 hours; when the tubes are patent the solution will be seen in the pelvis or pouch of Douglas. If they are blocked, the site of stricture will be demonstrated on the hystrogram. The accompanying photographs taken in co-operation with Dr. G. Galstaun will make my meaning clear.

*Number 1* is that of a lady who had had a Gilliam operation performed in another part of India for sterility plus retroversion of the uterus some years ago without result. The hystrogram demonstrates that the uterus is or has been pulled too much over to one side and that the right tube, though patent and beautifully shown, is kinked and deviated to the left. Lipiodol is seen emerging from the left tube ostium.

*Number 2* shows the lipiodol free in the peritoneal cavity 12 hours later. It is noteworthy that the solution causes neither pain nor after reaction.

*Number 3* is that of a case of one child sterility. I found that she was negative to Rubin's test at 250 mm. Hg. pressure; as nothing was palpable it was necessary to discover whereabouts the block in the tubes was, before giving a hopeless prognosis. The lipiodol test very perfectly demonstrates that the block is at the fimbriated ends of both tubes and that no lipiodol can escape the so-called phimotic tubes.

*Number 4* taken 12 hours later, confirms the finding. In this case the importance of the test is amply shown, for after the simple plastic operation of salpingostomy this lady can look forward to conception; whereas had the block been shown in the photograph to be in the isthmial portion of the tube it is probable that no operation however ingenious would have been successful.

*Number 5* is another case of sterility, the history being that 3 years ago she was operated upon urgently for a ruptured extra-uterine pregnancy. Vaginally, the uterus appeared smaller than normal and somewhat deviated to one side, which would not be an unlikely finding after such a catastrophe. A Rubin test was positive at 200 mm. but not being quite satisfied I confirmed the finding with lipiodol and you will see that the cavity of the uterus is large and directed towards the patent left tube. There is no indication of the normal triangular appearance of the cavity of the uterus, presumably, therefore, she was a case of pregnancy in one horn of a

# PLATE I.

Some clinical types of the cervix uteri. Adapted from Tavssig, Crossen and Dickinson and painted by Mrs. Clarke of Kurseong.

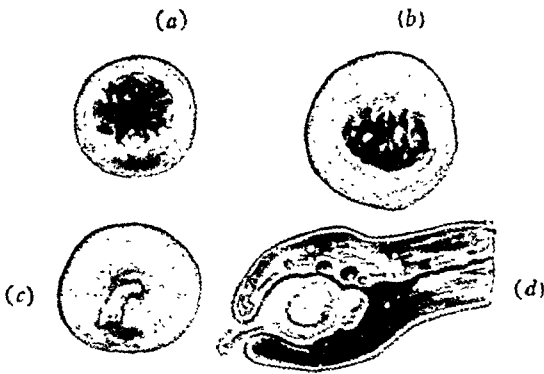


Fig. 1.—(a) An erosion in a nullipara; (b) an erosion with eversion of the mucous membrane due to long standing endocervicitis in a nullipara; (c) cervix with a mucous plug in a case of sterility; (d) half section of such a cervix showing mucous plug as a result of hypersecretion of the endocervical glands blocking the passage to internal os. Many contraceptives in common use may cause this.

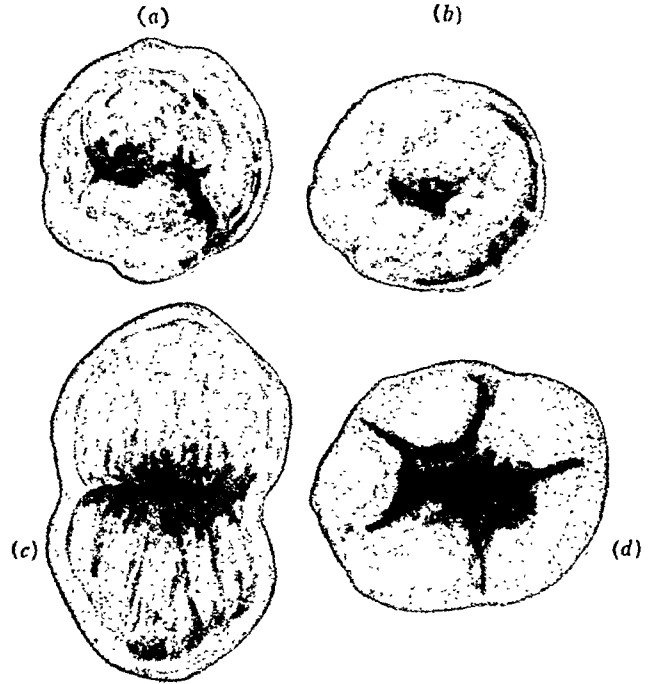


Fig. 4.—(a) Bilateral lacerated cervix with everted mucous membrane (Kelly), a fertile field for the development of cancer. Such a case is treated best *not* by actual cautery but by early amputation (Bonney method) or by vaginal hysterectomy or radium. (b) Lacerated cervix with ovula Nabothi; (c) a duck bill lacerated everted cervix, often a precancerous condition; (d) a lacerated stellate cervix with eversion of mucous membrane, often precancerous.

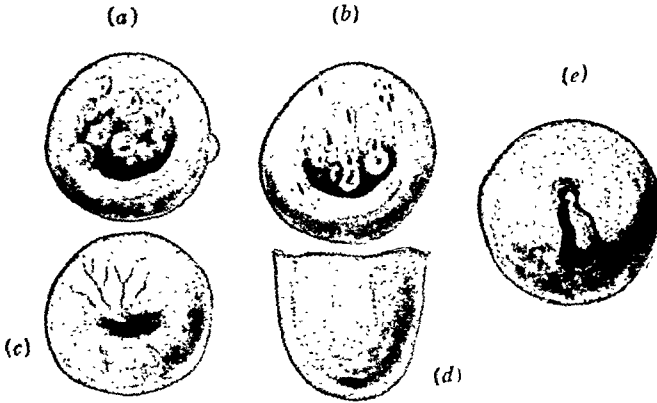


Fig. 2.—(a and b) The cervix of a parous woman showing eversion and many ovula Nabothi, such patients frequently have pain in the back and profuse periods due to hyperplasia of the endometrium; (c) shows varicose vessels and a few ovula Nabothi stabbed with cautery; (d) the typical conical cervix with so-called pin-hole os, associated so often with sterility, dysmenorrhœa, and the infantile or subpubescent uterus; (e) a cervix with a mucous polypus presenting at external os, causing continuous sanious discharges.

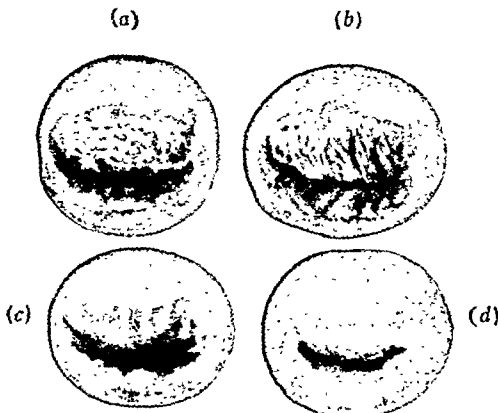


Fig. 3.—(a) The lacerated everted cervix of a multipara showing large readily bleeding papillary erosion, the outward and visible sign of an inward and invisible infective endocervicitis, the so-called precancerous cervix; (b) the same after the endometrium and endocervix have been curetted and the cervix has been radially electro-cauterised; (c and d) the same seen 4 and 8 weeks after actual cautery.

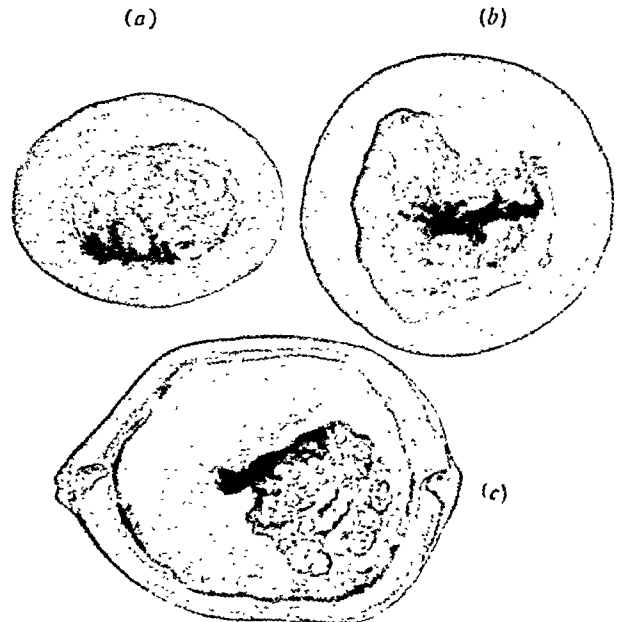


Fig. 5.—(a) An early case of squamous-celled cauliflower cancer of the cervix (Ruge); (b) the ulcerative type of cancer of the cervix (Ruge). Radium treatment by an expert is the best means we possess of giving a fair prognosis, with subsequent deep x-ray therapy. (c) An ulcerative type of cancer beginning at a scar at the left edge of the external os.



bicornuate uterus and the prognosis is in consequence extremely doubtful. The hystrogram diagnosis was confirmed by the history of a supposed normal pregnancy in the uterus (she was seen by a London consultant before sailing for India) which terminated by sudden rupture on board ship at the 20th week, just outside the port of Calcutta.

Number 6 is that of a case of one-child sterility sent to me from the Punjab to do a Gilliam operation upon for slight retroversion. There was no prolapse of the ovary, and the lipiodol was positive at 150 (Beclere instrument). The hystrogram shows both tubes patent, and the one more easily than the other. Obviously, therefore, no surgical interference is necessary. This case demonstrates the practical importance and prognostic value of the lipiodol test.

These hystrograms will I trust interest and instil enthusiasm into the scientifically minded members of our profession who are in touch with teaching units, for there can be no doubt that they enhance the art of gynaecology. Nowadays it is no longer necessary to operate in order to "look see," for the good clinician with the help of the radiologist can make an accurate diagnosis and prognosis before advising operation.

Quite apart from its diagnostic value in many morbid conditions of the pelvis, which I need not here go into for Statham and Forsdike have written of these, I should like to state that the simple painless injection of 5 to 10 c.c. of lipiodol through the healthy cervix into tubes which have been proved patent by Rubin's test about the fifth to the ninth day after the last day of the period is of very decided therapeutic affect, 30 per cent. of patients becoming pregnant as a result of this measure alone, provided coitus does not occur until 6 to 8 weeks after the injection. It should be noted that whereas the affect of the Rubin test is at the most 3 months, the effect of the lipiodol lasts for nine months. The reason for this may be that the iodine tones up or invigorates the tubal mucous membrane or the surface of the ovary and so renders the transit and nidation of the ovum and spermatozoa more easy.

The writer having performed a very large number of these two tests, would like to emphasise a clinical maxim of great importance, namely, if in any case of retroversion or retroflexion of the uterus with sterility a Rubin test is positive at or about 100 mm. Hg. pressure, then there is no justification for pelvic engineering, e.g., Gilliam's operation. But if the test is only positive at or over 150 mm. Hg. then operation is indicated, for it means that there is probably a partial kink forming a mechanical block in the tube, while the uterus is in the backward position.

Occasionally when all methods of diagnosis and treatment have been investigated and tried, an abdominal operation will demonstrate some ovarian lesion which was impalpable bimanually.

I have had quite a considerable number of such cases, who have become pregnant after operation. For instance I have found small soft cysts in one or both ovaries, varying in size from a cherry to a ping-pong ball, full of clear gelatinous fluid. These are shelled out with ease, and for some reason not perfectly understood, healthy normal ovulation occurs afterwards.

In others the ovary has been found shut off from the peritoneal cavity and fimbriated ends of the tubes by delicate veils of peritoneum, denoting previous inflammation. When these have been removed pregnancy has occurred later.

Occasionally the ovaries have been found treble their normal size, prolapsed, and almost dropsical in appearance. Hemi-section and suture elevation of the organs has given happy results. There is, however, a clinical condition, namely gross thickening of the tunica albuginea which is most disappointing, for scarification or paring off the thick coat is only followed by greater fibrosis, such ovaries are hard and wrinkled, grey and small. I have yet to see one of these patients bearing a child to full term.

*Protein Therapy.*—It has been shown by Holler, Weiss and Hibbert that the effect of the injection of foreign protein is: (1) to increase the function of the hæmopoietic organs; (2) to increase the number of phagocytes in the blood stream; (3) to increase the number of active antibodies in the blood.

Protein therapy is a very useful adjuvant to gynaecology for those complaints which give rise to suffering, but for which operation is inadvisable or not imperative. For instance:—

- (1) The fixed, tender, enlarged, displaced uterus.
- (2) Tender and enlarged tubes and ovaries, accompanied by occasional fever.
- (3) Thickened and tender utero-sacral ligaments with sacralgia.
- (4) Tenderness and thickening at the base of the bladder.
- (5) Parametrial exudates.

In hospital practice I use plain freshly boiled skimmed milk, but in private a preparation known as Aolan. The first dose, given intramuscularly, is 5 c.c. and after that 7 to 10 c.c. are given every four days, or six doses in all. From a detailed consideration of a great number of cases, I am satisfied that this treatment is of great value. Indeed it is surprising to discover by palpation that after this more or less painless treatment, exquisitely tender inflammatory exudates have melted away and to hear a patient voluntarily tell one that the pain and backache have disappeared. The greater the reaction, the better the result. In the case of a tubo-ovarian mass, pending operation it is of value, because whilst marking time it raises the resistance of the patient.

*Carcinoma of the ovary.*—A remarkable series of these cases which occurred in the writer's practice during 1928 makes it imperative to consider this condition, for tumours of the ovary

are extremely common in the tropics and there is a tendency to delay sending such cases until they are of great size, thereby running the extreme danger of malignant degeneration.

Doderlein found that 10 per cent. of all ovarian tumours were malignant. Lippert states that 15.5 per cent. are malignant.

Carcinoma of the ovary is rare before the age of 20, and of greatest frequency between the ages of 45 and 50. A feature of malignant ovarian tumours is that their growth is very rapid and almost without symptoms, indeed a tumour may be discovered accidentally.

Ascites may or may not be present; the uterus is as a rule displaced to one side. Irregular menstruation or metrorrhagia may bring a patient to her doctor and it is a *good clinical maxim to remember that irregular menstruation after the menopause is frequently associated with cancer of the ovary if the uterus cannot be incultated.*

The only treatment is immediate operation with the removal of both ovaries and the uterus, followed by post-operative radiation. The death-rate from recurrence is 76 per cent. in the first year and 15 per cent. in the second year. So great is the mortality and recurrence rate that in recent years, where the tumour is hardly removable, palliative injections of selenide of lead combined with deep x-ray therapy have been used.

Todd, who is the originator of the selenium treatment of inoperable cancer both of the ovary and uterus, has had some remarkable results, results anyhow more happy than those of surgery. I have seen some of his cases and it is quite remarkable to observe the shrinkage and stony hardness that occurs in the tumour as the result of the intravenous injection of selenium, prepared by the B. D. H. Company according to the Bristol formula.

*Problems associated with the cervix uteri.*—At the present moment there is only one known way to combat cancer mortality and that is by the recognition of the process in its earliest stages, or better to identify those lesions which are definitely known to be forerunners of malignancy.

The importance of this statement will be realized when the public and all practitioners remember that one out of every 27 women die of cancer of the uterus. Now, it is a well known fact that women who have never borne children or in whom there has never been any previous inflammatory process within the cervix, rarely develop cancer of that organ. What then is the pre-cancerous stage in a woman who has borne children? Surely it is the presence of chronic inflammation, the result of chronic irritation. This irritation being most probably of a chemical nature, just as coal tar produces carcinoma of the scrotum and a pre-cancerous condition of the epithelium can be produced in the skin of a rabbit by the application of coal tar.

It has been suggested that the constant bathing of the cells of the vaginal portions of the cervix which were intended to remain in an alkaline

solution with a purulent acid secretion is an important factor in the causation of malignancy. Nevertheless it must be remembered that chronic inflammation and irritation is kept up by the presence of hosts of bacteria which harbour in the complicated glandular arrangement of the cervical mucous membrane, and that an erosion of the cervix is neither an ulceration nor granuloma, but rather an adenoma.

We do not yet know the exact cause for the proliferation of cells previously normal to form what we call microscopic cancer, but there seems little doubt that chemical and bacterial irritation and inflammation are the predisposing factors. Therefore it behoves us in every case of erosion plus laceration in a parous woman over the age of 30 to insist on adequate treatment, and by that I do not mean painting with picric acid or carbolic, or the use of diathermy and such like tinkering gynæcology, which prostitute the good name of our Art, but rather excision, amputation or electric cauterisation of the entire diseased area.

Huggins, in 2,985 cases treated on these lines during the last ten years, has never seen one of these patients develop cancer of the cervix, and in an admirable thesis he deplores the carelessness of the gynæcologist in his responsibility to infections within the cervix, and states that it is our duty to teach both the profession and the public that every infected cervix should be adequately treated as it carries with it the possibility of malignancy. He prophesies that the time will soon arrive when women will consult the gynæcologist once in six months just as they do their dental surgeon.

Time and again the writer has insisted on the importance and necessity of an adequate pelvic examination with the use of a speculum in the case of all women consulting their doctor, either immediately or remotely after confinement, or abortion. The accompanying plates I trust will greatly facilitate diagnosis, prognosis, and treatment.

*The vesico-vaginal fistula.*—Colonel Fraser has published in the *Indian Medical Gazette* recently an illuminating article which is of special interest to all practitioners in India, for the majority of fistulae seen are so large, so high up, so surrounded with dense scar tissue, or so unget-at-able because of a contracted pelvic inlet and outlet, that any improvement in treatment must be welcomed.

His method is that of rectal transplantation of both ureters. He reports 24 cases, with success in 22 and no mortality, and gives in detail his technique. The operation is done in two stages, first one ureter is implanted, and then three or four weeks later the second ureter is dealt with.

The writer having performed this operation in a case of ectopia vesicæ with success is greatly impressed with Fraser's technique and results, and is determined to follow him at the first opportunity; moreover he is glad to see that the

PLATE II.



Fig. 1.



Fig. 2.



Fig. 3.



A gelatinous material deposited on the top. It was removed and filtered, giving a clear red fluid which became frothy on shaking, giving a suggestion of the presence of a saponin. After keeping the solution for 48 hours the solution decomposed giving a brownish precipitate.

Our next attempt was to isolate\* the alkaloid.

*Method No. 1.*—Half a pound of powdered *nakchhikni* was treated with 1 per cent. sulphuric acid on a water bath for two hours and kept overnight with frequent agitation at intervals. The dilute acid extract was pressed and filtered, and the residue was exhausted with water till free from acid. The acid extract was now neutralized with ammonium hydroxide and the whole evaporated to dryness on a water bath. The dried residue was extracted with absolute alcohol and filtered. The filtrate was diluted with an equal volume of water (to precipitate the resins) and filtered. It was then evaporated, treated again with 1 per cent. sulphuric acid and filtered. It was then preserved for alkaloidal tests (*Fluid No. 1*).

*Method No. 2.*—Next we proceeded to deal with the watery extract which in our preliminary experiment showed a stimulating action on the frog's heart. Two pounds of powdered drug was boiled with water for six hours. The whole was pressed and strained. On cooling a layer of gelatinous substance collected at the top which was removed. The watery extract was red and produced a persistent froth when shaken. The whole of the watery extract was dried to a paste and extracted with rectified spirit, filtered and evaporated. This was now extracted with chloroform. The residue was a bitter principle, preserved for test (*Residue No. 1*). The solution of the extract was filtered and evaporated. Some of it was preserved for tests (*Residue No. 2*). It was then boiled in 1 per cent. sulphuric acid, which left a dark green resinous residue, and a clear solution above. It was filtered and both preserved for tests (*Residue No. 3*), and (*Fluid No. 2*).

The various residues and fluids thus obtained were then tested to determine whether they contained alkaloids, glucosides or resins.

*Tests.*—Fluids Nos. 1 and 2 gave a precipitate with mercury perchloride, picric acid, tannic acid, iodine solution, phosphomolybdic acid, phosphotungstic acid, mercury potassium iodide (Dragendorff's reagent). A control was kept with 1 per cent. sulphuric acid and with 1 in 1,000 of quinine sulphate, which gave corresponding precipitates. It also gave a Prussian blue reaction when fused with sodium and treated with ferrous sulphate and acidified with hydrochloric acid (test for nitrogen). It gave no colour reactions, probably due to impurities.

*Residue No. 1* was a bitter principle, soluble in water and alcohol, less so in chloroform. It reduced Fehling's solution to some extent, but copiously so when hydrolysed with 1 per cent. sulphuric acid.

*Residue No. 2* was insoluble in water, soluble in alcohol and chloroform, greenish in colour, and when tasted it gave a pricking sensation.

*Residue No. 3* was a dark green resinous substance, colourless, and when heated to 100°C. it becomes semi-solid. It dissolves in alkalis and in alcohol, but is insoluble in water and acids.

It appears from the above tests that *Centepeda orbicularis* contains:—

- (1) An alkaloid.
- (2) A soluble glucoside.
- (3) Traces of saponin.

Of the above total contents probably the active element is the alkaloid, inasmuch as a watery solution kept for over three months was found pharmacologically active a period sufficient to decompose glucosides and saponins.

#### PHARMACOLOGY.

*Heart.*—A frog's heart was perfused with R/10 Ringer's solution (i.e., NaCl 0.6 per cent., KCl 0.03 per cent., calcium chloride 0.0025 per cent., *vide* Burridge, at 19°C. with the usual result of a diminution of contraction within half an hour.

Next at D<sub>2</sub> the watery extract in R/10 at pH 10 was perfused. A gradual rise in contraction followed, as shown in tracing 1B. The strength was successively increased with the result that the maximum contraction was attained at D<sub>2</sub>. It was maintained at practically the same level till the strength was increased to D<sub>6</sub>. At D<sub>7</sub> it began to show positive signs of heart block, ventricular contraction nearly disappeared, followed by complete stopping (Fig. 1D).

The heart was washed out with R/10. Normal rhythm was restored.

From the above observation we could not but come to the conclusion that *Centepeda orbicularis* has a distinct action on the frog's heart, stimulating it by increasing the force of the contractions, and prolonging its systole. In larger doses it has a poisonous action as shown by its causing final heart block.

#### SUMMARY.

- (1) *C. orbicularis* contains an alkaloid, a glucoside, and traces of saponin.
- (2) It increases the force of contraction of heart, prolongs the systole, and causes heart block in larger doses.

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\* Isolation was done under Dr. S. M. Sane's directions (Department of Organic Chemistry, University of Lucknow).



PLATE.



Fig. 1.—Mediastinal tumour: before treatment.



Fig. 2.—Mediastinal tumour: after treatment.

## THE EFFECT OF RADIATION THERAPY UPON MEDIASTINAL TUMOURS.

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MEDIASTINAL tumours belong to a rare variety of disease and the result of treatment is very unsatisfactory. These tumours can be classified according to whether they are radio-sensitive and radio-resistant.

(a) Radio-sensitive mediastinal tumours are:

1. Lympho-granuloma.
2. Lymphosarcoma.
3. Carcinoma.
4. Intrathoracic goitre.
5. Thymus hyperplasia.
6. Malignant metastatic growths.

(b) Radio-resistant tumours are:—

1. Teratoma.
2. Lipoma.
3. Fibroma.
4. Neuroma.

Ross of the Brompton Hospital cited 80 cases of mediastinal tumours of which 32 cases were histologically found to be lymphosarcoma, 12 cases other forms of sarcoma, and 10 cases carcinoma. The post-mortem records of the Johns Hopkins Hospital seem to indicate that Hodgkin's disease is by far the commonest tumour of this region. Lindstaedt says that the commonest benign growths appear to be dermoid cysts; 45 cases have been reported in the literature. They have usually been diagnosed in life by rupture into a bronchus and the consequent expectoration of hair, teeth, etc.

Large mediastinal masses due to tuberculosis and syphilis are occasionally observed. Martini in a series of 14 mediastinal tumours, describes 3 syphilitic growths, 2 tuberculous ones, 3 lymphosarcomata, 2 sarcomata of other kinds, 1 carcinoma, 1 hypertrophic thymus, 1 retrosternal thyroid and 1 undiagnosed tumour.

Burnum had 8 cases, of which 6 were lymphosarcoma, 1 probably malignant disease of the thymus, and 1 Hodgkin's disease.

Schaff has collected 70 cases, of which 34 cases were lymphogranuloma, 6 cases sarcoma, 7 cases carcinoma, 3 cases struma malignum, 1 a thymus hyperplasia, and the remaining 20 cases tumours of uncertain diagnosis. Twenty of these 70 patients, i.e., 28.6 per cent., lived more than two years: of these 20 cases, 8 were lymphogranuloma, 3 sarcoma, 1 carcinoma, 2 struma malignum, 1 thymus hyperplasia, and 5 malignant tumours without having any definite differential diagnosis. Sixteen patients, i.e., 23 per cent., lived more than 3 years, of which 5 were lymphogranuloma, 2 sarcoma, 1 carcinoma, 2 struma malignum, 1 thymus hyperplasia, and 5 malignant growths of uncertain origin. Seven patients, i.e., 10 per cent., lived more than 5

years, of which 1 was a lymphogranuloma, 1 a sarcoma, 1 a carcinoma, and 4 malignant tumours of uncertain origin.

*Technique of Treatment.*—From a review of cases collected by various authors we find that most mediastinal tumours are of malignant origin, and not amenable to surgical interference. Burnum in his series of 8 cases applied only radium treatment and got satisfactory results. The dose used by him was rather a heavy one, varying from 88,055 m.g.h. to 245,992 m.g.h. on several occasions. He used a 3 mm. lead filter and the whole wrapped with gauze 3 inches thick. Radium was applied from different portals and for varying periods.

Schaff's 70 cases were all treated with deep Roentgen therapy with very good results. The filters used in his cases were  $\frac{1}{2}$  to 3 mm. Zn. and 1 mm. Al.; F. S. D. varying from 23 to 50 cm., and having a spark-gap of 38 to 42 cm. The dose required for lymphogranuloma cases was  $\frac{1}{3}$  to  $\frac{1}{2}$  of the skin erythema dose, and for malignant tumours was about 1 S. E. D.

The writer also obtained good results with deep X-ray treatment. He works with the Tropical Stabilivolt apparatus of constant potential type. According to the Seva-Sadan standard as worked out by the writer, the skin erythema dose upon the Indian skin has been obtained within 20 minutes when working with 180 kv., 4 ma. current, 0.5 mm. Cu and 1 mm. Al as filters, 30 cm. skin-target distance and having a portal  $10 \times 15$  cm.\* As will be shown below, the writer's case got deep X-ray exposures from different portals, and the result was quite satisfactory.

*Case.*—The patient, B. P., aged 30, a male, Hindu, a resident of Hazaribagh, was recommended by Dr. B. C. Ray to come under deep X-ray treatment on 4th December, 1927, for the following condition:—(1) breathlessness on walking, (2) swelling above the clavicle, (3) cough, the duration of all these symptoms being two months.

The general condition of the patient was far from satisfactory. He was of medium size and slender. Examination of the eyes, nose and throat revealed no troubles. No enlarged glands were found in the neck and anterior aspect of the thorax; the face looked flushed. Heart-sounds were clear; the pulse rate was 72 per minute, and equal on both sides. There was no rise of temperature. Immediately above the middle half of the left clavicle could be felt a mass. This was hard in feel, fixed, and continuous with the dullness felt behind the sternum. The dullness extended 2½ inches to the right of the sternum, and 3 inches to the left.

The blood examination by the Wassermann reaction gave negative results, and there was no history of fever.

The case was clinically diagnosed as a lymphosarcomatous growth of the mediastinum.

An X-ray skiagram was taken (Fig. 1). It shows a big growth in the posterior mediastinum extending more to the left side and reaching above the jugular notch. It was found to be pulsating on screen examination.

\* Mitra, S. The biological effect of deeply penetrating Roentgen rays upon Indian skin, and its practical application in deep Roentgen therapy. *Calcutta Medical Journal*, March, 1929.

A course of deep Roentgen-ray treatment as shown in the table below was given:—

The X-ray diagnosis and treatment. *Long Island Med. Journ.*, Bd. 20. Ref. *Zentr. d. Radiologie*, 2187.

Date.	Site of application.	Focus tube.	Rn Tube.	M. A.	VOLTAGE.		Filter.	F. S. D.	Time in minutes.
					Ta.	Tb.			
4-12-27	Anterior aspect of chest.	Nil	R1	4	180	173	0.5 mm. Cu. 1 mm. Al	30 cm.	20
5-12-27	Posterior aspect of chest.	Nil	R1	4	180	173	Do.	Do.	20
18-4-27	Left supra-clavicular region.	Yes	R1	4	180	173	Do.	32 cm.	20
21-4-28	Over the back ..	Do.	R1	4	180	173	Do.	30 cm.	20
24-4-28	Anterior aspect of chest.	Do.	R1	4	180	173	Do.	Do.	20

Four months after the first course of treatment, the patient presented himself for examination. There was no breathlessness and no engorgement of the veins of the neck. A second skiagram was taken (Fig. 2). The mediastinal tumour had entirely disappeared, and the left supra-clavicular glands were palpable. A second course of deep X-ray treatment was given as shown in the table. The patient was quite all right for about a year.

Since the beginning of 1929, the difficulty of breathing appeared again, but the patient instead of informing us took treatment from a local doctor. The condition not being improved, he came again to us on 16th February, 1929. He was found in a very bad state; marked dyspnoea was present, the patient not being able even to lie down. There was a swelling in the supra-clavicular region; veins engorged in the neck. The pulse was soft, thin and rapid. An X-ray examination was made. The mediastinal tumour appeared again, and practically the whole of posterior mediastinum was occupied by it. The patient visited another X-ray clinic for treatment, our X-ray machine not being in proper working order. The condition was so precarious that he died within a week.

#### CONCLUSION.

Mediastinal tumours are amenable to deep X-ray treatment, but as in other malignant cases the patient must always be in touch with the doctor, and the treatment should be repeated at suitable intervals. In this particular case, the patient did not take any further treatment within the last 10 months. Had he presented himself earlier, the case might have been reacted favourably.

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#### THE USE OF A STANDARDISED PREPARATION OF THE TOTAL ALKALOIDS OF KURCHI BARK IN AMOEBIC DYSENTERY.

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KURCHI bark and kurchi seeds have been reputed drugs in the Indian system of medicine from almost prehistoric days, being mentioned by Charak in nearly 1000 B.C. for the treatment of subacute and chronic dysenteries. Though the alkaloids were isolated as early as 1853 by Haines, and also by R. C. Dutta in the Chemical Department of the Medical College of Bengal in 1880, and whilst recently some of the local drug firms have put up liquid extracts of it for sale on the market, yet it must be admitted that insufficient advantage of its amoebicidal properties was taken until the researches of Acton, Chopra and Knowles during the last two to three years placed its use upon a scientific basis.

Since the publication of a paper on kurchi alkaloids by Chopra, Gupta, David and Ghosh in the *Indian Medical Gazette* in 1927, and also the contribution by Acton and Knowles "On the Dysenteries of India" in 1928, I decided to take up the investigation of this subject in my hospital and to try and find a *cheap and efficient standardised preparation* for general use.

Chopra and his colleagues have shown that the total alkaloids of kurchi are as active as emetine, though probably their action is a little slower, but they have the distinct advantage of being entirely non-irritant, non-depressant, and have no toxic action on the nervous system. Being non-emetic, the drug is capable of oral administration, and the purified alkaloids when given subcutaneously cause much less local pain than does emetine.

Acton and Knowles remark—"The position with regard to kurchi, in fact, is so interesting that further investigations are urgently called for..... There are large supplies of kurchi

available in India, and both it and conessine could be manufactured at a price well below that of emetine. We would like to draw the attention of the big chemical manufacturers in India to this drug."

My own observations began in July 1928. My immediate object was to find an effective preparation for oral administration which could be prepared cheaply and easily dispensed. The bazaar preparations then available were extract kurchi liq.—a more or less watery decoction, and the "Tabloid" of kurchi bark prepared by Messrs. Burroughs, Wellcome & Co. The watery extracts have hardly any reputation approaching that of emetine, and Acton and Knowles rightly remark—"the bazaar liquid extract, prepared from the powdered bark, is quite unstandardised and hardly suitable for use." I soon found out the reason for this.

I had the bazaar samples of Messrs. B. K. Paul, Messrs. Smith Stanistreet & Co., The Union Drug Co., and of Dr. Bose's Laboratory analysed with regard to their alkaloidal content, and the content of total alkaloids was found to vary from 0.214 to 0.128 per cent (Majumdar, 1929). The usual therapeutic dose of this preparation is from 1 to 3 drs. daily, and therefore the patient would receive only from 0.15 to 0.3 gr. of the total alkaloids in 24 hours. Assuming that the kurchi alkaloids are as effective as emetine, this quantity, given to a patient with frequent stools, must be considered to be utterly insufficient for any therapeutical value.

The indigenous method of preparation was also examined. No watery decoction will give a higher alkaloidal content than 0.15 per cent., and therefore such a preparation cannot be expected to have the specific action of the alkaloids, though its large percentage of tannin might exert some beneficial action in cases of chronic bowel disease.

I therefore decided to have a standardised preparation made, containing a definite amount of the active principles. Fortunately, Mr. Surendra Bhusan Sen, M.Sc., Superintendent of the Bengal Chemical and Pharmaceutical Works, came to my assistance. We worked together for some time, until we evolved an alcoholic extract yielding 1 per cent. of total alkaloids, and not more than 0.25 per cent. of tannin. The daily dose of this preparation which I gave was from 6 drs. to 1 oz., containing from 3 to 4 grains of the total alkaloids. Though even double this quantity is well tolerated, I found that 3 to 4 grains daily was sufficient, provided that not too much of it was evacuated in the stool.

My preliminary report on 15 cases treated with this preparation was read before a medical conference in December 1928, and subsequently published in *Advance Therapy* in January 1929. In that report I showed that, not only are the total alkaloids well tolerated when given by the mouth, the results are also quite dependable, and they rank as high as does hypodermic injection of emetine.

A further series of 34 cases, all showing the motile, vegetative forms of *Entamoeba histolytica* in the stools, have since been treated with this preparation of the total alkaloids, between January and November 1929, the drug being administered orally. The results in this series were as follows:—

	Cases.	Deaths.
1. Pure amoebic dysentery ..	23	5
2. Amoebic dysentery, complicated with bacillary dysentery (mostly Flexner bacillus infections) ..	9	4
3. Cases of amoebic dysentery, complicated with pulmonary tuberculosis ..	2	2
TOTALS ..	34	11

Superficially, these results might appear to be bad, but it is necessary to call attention to the type of cases received at the Carmichael Hospital in Calcutta. They are almost exclusively street beggars in an extreme state of poverty, devitalised to an extreme limit, and usually in a condition of advanced cachexia. Many had œdema of the feet on admission, and even ascites, with incessant stools. In such cases the disease must be attacked by vigorous measures, for there is so little margin for the patients to struggle on, and if they sink to a lower level, nothing will be of any use. On account of the incessant stools in such cases I have frequently had to combine binding medicines with the kurchi preparation in order that the latter might not be evacuated too rapidly.

The general lines of treatment adopted were as follows:—

(i) If there were not too many stools, 10 or less in the 24 hours, the patient was given the standardised extract of kurchi, 6 drs., only, divided into three doses, a day. Under this regimen amœbæ disappeared by the fourth or fifth day, and sometimes earlier. The treatment with the preparation was continued uninterruptedly however for 7 to 10 days according to the severity of the infection, and sometimes a second course of treatment was given after an interval of 4 to 7 days.

(ii) If the stools were more frequent than this, some binding medicine had to be alternated with the kurchi preparation, in order to give the latter a chance of being retained for a sufficiently long time. Therefore mist. creta preparata B. P., and kaolin, bismuth carbonate, or bismuth carbonate with tincture of opium, were given according to the frequency of the stools. But at the same time care was taken not to cause constipation too early, before the alkaloids had a sufficient sterilising effect on the amœbæ.

This preparation of kurchi alkaloids has a very bitter taste, though it is in no way nauseating; yet—as with quinine mixture—patients often dislike it on this account. Further, it often produces no binding effect, and watery faecal stools continued although the entamœbæ had disappeared. In such cases, again, binding medicines had to be given to hasten the convalescence.



Medical College of Bengal and to Dr. J. N. Moitra of the Campbell Medical School for having a large part of the bacteriological examinations done in their laboratories, and also to Mr. S. B. Sen, M.Sc., Superintendent of Bengal Chemical and Pharmaceutical Works, for kindly arranging for all analytical work and preparing the different samples used in this investigation. The successful preparations he has already put on the market, having a standardised alkaloidal content.

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### A PRELIMINARY REPORT ON THE SUITABILITY OF PARIS GREEN AS AN ANOPHELINE LARVICIDE AS APPLIED TO PUNJAB CONDITIONS.

By M. YACOB, M.B., B.S., D.P.H., D.T.M. & H.,  
and

K. S. SHAH, M.B., B.S., D.P.H., D.T.M.

(From the Punjab Epidemiological Bureau, Lahore.)

HAVING recently come across an article on "Paris Green as an Anopheline Larvicide" by Sur and Haripada Sarkar in the July 1929 issue of the *Indian Medical Gazette*, we believe perhaps it may be of interest to workers on the subject if we publish the results of our experiments which were carried out under orders of Lieut.-Col. C. A. Gill, I.M.S., the Director of Public Health, Punjab, during the months of July, August and September 1928 for official purposes, with a view to determining the practical and financial feasibility of employing this method of larval destruction on a large scale in the Punjab. The report on the experiments which was submitted in December 1928 is reproduced verbatim as follows:—

In view of the increasing importance of Paris green (copper-aceto-arsenite) as an anopheline larvicide, a series of experiments, both field and laboratory, were carried out with a view to test the efficacy and practicability of the measure, standardising the procedure, and determining the cost per unit area.

It appears that the credit for the discovery that destruction of anophelines can be accomplished by means of dusting poisonous powders upon water belongs to Roubaud(1), who in 1920 successfully used paraform-aldehyde. Barber(2) during his search for a cheaper and more effective poison than paraform-aldehyde used a number of arsenical compounds and finally selected copper-aceto-arsenite on account of its reliability and higher toxicity for anopheline larvæ than that of any other poison tested. Barber, Hackett and others have shown that the

powder is easy and convenient to use after dilution with fine road dust in a strength of 1:100. The diluted powder when sprinkled on the surface of water in the form of a fine spray keeps floating for a considerable time and its particles are easily ingested by the surface feeding larvæ. The anopheline larvæ, being surface feeders, swallow all particles that are small enough to enter their mouths, and according to this author they do so without any regard to their being food or poison. He further asserts that Paris green can be used for any type of breeding place without previous removal of vegetation, while another great advantage is stated to be its comparative harmlessness for all forms of vegetable life and animals including fish, cattle and domestic animals when used as a 1 per cent. mixture. On the other hand Chalam(3) states it has no action whatever on any of the aquatic stages of culicine mosquitoes nor on the eggs and pupæ of anophelines.

Paris green was used successfully on a large scale by Hayne(4) in the United States in 1922, and since 1923 it has been extensively employed as an anopheline larvicide by Kligler and Shapiro(5) in Palestine, Boyd and Davis(6) in Brazil, Tiedeman(7) in the Philippines and by Hackett(8) in Italy. King(9) of the U. S. A. Bureau of Entomology has also carried out experiments by attempting to spray the dust from aeroplanes over large marshy areas. His results are reported to have been uniformly successful. Experiments have also been carried out by Nicholls(10) in Ceylon, and by Dalal and Madan(11) and Chalam(3) in India.

The preparation known as Paris green has been in use for some time in agriculture as an insecticide and is known by a variety of names, e.g., Schweinfurt green, Mitis green, emerald green, imperial green. Chemically it is copper-aceto-arsenite ( $3\text{Cu H As O}_3 + \text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$ ) a double salt of copper-arsenite and copper acetate. Pure Paris green contains 58.56 per cent. arsenious anhydride and as the commercial products vary in their composition, the name Paris green under the Federal Insecticide Act of 1910, U. S. A.(8), is only used for those products which contain a minimum of 50 per cent. arsenious anhydride. It is a microcrystalline powder of emerald green colour. The sample of Paris green 606 D which was used in the experiments detailed below was obtained from Messrs. G. Siegle and Co., Stuttgart, Germany. As the substance is frequently adulterated it was deemed expedient to have it analysed before use for an estimation of its arsenical contents. The analysis was carried out by the Chemist, Public Health Department, Punjab, who reported the sample to contain 57.7 per cent. of arsenious anhydride and the substance to be practically insoluble in water.

#### Field experiments.

The experiments were carried out in the summer of 1928 during the months of July, August,

and September. The place selected for the experiments was the Mian Mir storm water channel also, called the Chauburji outfall drain, in Lahore. The channel in its course to the River Ravi from Lahore Cantonment passes under the Bari Doab Canal from east to west, and after passing in front of the Punjab Mental Hospital, which is situated close to the canal, continues its course behind the Central Jail, Lahore. The portion of the channel chosen for the experiments after careful measurement was divided into ten sections, each consisting of 108 yards. The sections were demarcated by means of wooden pegs with numbers marked on each.

From 26th July to 8th August, general preliminary larval surveys of the whole channel were made in order to determine the character of the water and nature of the bank in each section, as well as the relative prevalence of anopheline larvæ in the area. It was found that owing to the failure of the monsoon there was no water in sections I, II and III. Sections IV and V contained stagnant water and their banks were overgrown with weeds, long grass and brushwood. Culicine larvæ were plentiful in the sections, but anopheline larvæ were found to vary on an average from 15 to 20 per even ten dips of an enamelled soup dish with a diameter of 10 in.—ten dips having been adopted as the standard for comparing the relative density of larvæ in the various sections. Conditions in section VI, which was used as a control throughout the course of these experiments, were similar to those in section V, but sections VII and VIII were found to have slowly running water in them with 32 larvæ per ten dips. The banks of these sections were again overgrown with grass and weeds, and the surface was covered with leaves and algæ in various places.

Section X had a sullage water drain from the Lahore Central Jail opening into it, and therefore the water in this and the contiguous section No. IX was of a greenish tint with a somewhat offensive odour. As regards aquatic and marginal vegetation in these sections, no attempt was made to remove or alter the natural conditions in any way before the application of Paris green. It may be mentioned here that the anopheline adults bred out from the larvæ obtained from various parts of the channel consisted of *A. subpictus*, *A. culicifacies*, *A. stephensi* and *A. fuliginosus*.

The application of Paris green was started on the 13th August, the procedure adopted being that suggested by Hackett: 1 gramme of Paris green diluted with 99 grammes of fine road dust was used for every 10 square yards of water surface. An abstract of the protocols of some of the tests carried out are given in the attached Table. The results obtained indicate:—

- (1) That an area treated with Paris green remains free of anopheline larvæ until the 3rd day after greening, when very small larvæ again make their appearance.

TABLE.

Number of section.	Type of water.	Banks.	Surface area of water in the section.	Amount of mixture added with date.	Amount of pure Paris green used.	DENSITY OF LARVÆ.				
						Before.	1 day after.	2 days after.	3 days after.	4 days after.
Section IV	Stagnant pool	Overgrown with weeds.	37½ sq. yds.	3,730 grm. on 13-8-28.	37.3 grm.	8 in 10 dips	Nil	Nil	19 in 10 dips	..
Section V	Do.	Do.	Do.	3,730 grm. on 14-8-28.	37.3 grm.	15 in 10 dips	Nil	Nil	10 in 10 dips	33 in 10 dips
Section VI	Do.	Do.	Do.	3,730 grm. on 16-8-28.	37.3 grm.	19 in 10 dips	Nil	Nil	9 in 10 dips	..
Section VII	Slowly flowing	Do.	75 sq. yds.	750 grm. on 17-8-28.	7.5 grm.	32 in 10 dips	Nil	Nil	2 in 10 dips	..
Section VIII	Do.	Do.	540 sq. yds.	5,400 grm. on 17-8-28.	54 grm.	30 in 10 dips	Nil	Nil	95 in 10 dips	95 in 10 dips
Section IX	Stagnant	Do.	Do.	5,400 grm. on 21-8-28.	54 grm.	65 in 10 dips	Nil	Nil	Heavy fall of rain.	..
Section X	Do.	Do.	Do.	5,400 grm. on 22-8-28.	54 grm.	35 in 10 dips	Nil	Nil	Do.	..

- (2) That 1 gramme of Paris green diluted with 99 grammes of road dust is sufficient to destroy all anopheline larvæ in 10 square yards of water surface. Culicine larvæ, leeches, tadpoles, etc., remain unaffected.

A second series of experiments was carried out with 1:200 Paris green road dust mixture. The results obtained show that a little less than 50 per cent. of larvæ are destroyed by this dilution when observations are taken after 24 hours, e.g., in one case 105 larvæ were captured per 10 dips before greening, 24 hours after greening the number of larvæ was found to have been reduced to 47. Consequently it may be deduced that the highest dilution of Paris green compatible with efficiency is 1:100.

#### *Laboratory experiments.*

Simultaneously with the field experiments mentioned above a number of laboratory experiments were undertaken to decide:—

- (1) Whether Paris green has any effect on the pupæ of anopheline mosquitoes.
- (2) Whether the eggs of these mosquitoes are in any way affected by Paris green.
- (3) Whether anopheline adults would lay eggs on water that had already been treated with Paris green.

*Experiment I.*—Ten almost full grown anopheline pupæ were placed in water in each of two enamelled trays under mosquito nets, and 1 per cent. Paris green in the proportion of 100 grammes of the mixture per 10 square yards was dusted on one tray, the other being left as a control. Next day all the pupæ in both trays had hatched out into adult mosquitoes, showing that Paris green had produced no effect on the pupæ. This experiment was repeated three times with similar results.

*Experiment II.*—Some female anopheline mosquitoes caught from nature were allowed to lay eggs in two enamelled trays of equal surface area containing water. One tray was kept as a control, whilst the other was dusted with 1 per cent. Paris green. The eggs in both trays hatched out into larvæ. But whereas the larvæ in the control tray were active and lively, those of the other were sluggish in their movements and all were found to have been destroyed 24 hours after hatching; the control having remained unaffected. Apparently Paris green has no effect on anopheline eggs.

*Experiment III.*—Some water was put into two trays of equal surface area. One of them was sprinkled with 1 per cent. Paris green the other was left as a control. Both the trays were placed under one mosquito net and 10 gravid anopheline females introduced into it. After 24 hours it was found that eggs had been laid in both the trays, showing that anopheline females will lay eggs on water irrespective of the fact whether it contains Paris green or not.

*Re-application of Paris green and the length of time that should elapse between two treatments.*

Since laboratory experiments had indicated that Paris green has little or no effect on anopheline pupæ and that it only affects the anopheline mosquito during the larval stage of its existence, it was essential from the practical standpoint of mosquito control to determine the length of the larval stage under the conditions of temperature prevailing at the time of the ex-

periment. A number of experiments were therefore conducted in trays and jars, but these failed to solve the problem owing to the fact that larval stage was unduly prolonged in the laboratory.

The conditions under which the tests were carried out in the laboratory being far from comparable with those prevailing in nature, it was decided to undertake experiments under conditions as closely approaching nature as possible. For this purpose two borrow-pits of an approximate size of 5 × 3 ft. and 1 ft. deep were prepared on the 2nd September, one in the lawn of the Lahore Medical College and the other on the bank of the Mian Mir storm water channel. Both the pits were filled to the brim with tap water, and immediately covered over with mosquito-netting to prevent mosquitoes from laying their eggs in them. It may not be out of place to mention here that the rainy weather—the months of July and August 1928—had been exceptionally dry with almost total absence of rainfall until the 31st of August when the meteorological conditions suddenly changed and heavy showers took place all over the Province. The temperature and humidity factors which until then had been unfavourable for mosquito-breeding having approached the normal level, it was decided to commence observations on the 2nd September. Gravid anopheline females were allowed to lay eggs in the laboratory. In 24 hours the eggs had hatched out into larvæ and the new born larvæ were transferred to the two pits mentioned above. Observations were continued till the end of September and it was found that it took 7 days for the larvæ to develop into pupæ. The experiment was repeated twice and the length of the larval stage was found to be again 7 days on one occasion and 8 days on the other. During this period the mean maximum temperature was 95.9°F., and the mean minimum temperature 73.7°F.

It is thus clear that under optimum conditions of temperature such as are usually obtainable towards the beginning of autumn the minimum period of larval development varies from 7 to 8 days. It also follows as a corollary to the above that the interval between two applications of Paris green under the same conditions should not exceed 6 days.

#### *Effect of Paris green on very young larvæ.*

An experiment was arranged to ascertain whether 1 per cent. Paris green has any effect on very young anopheline larvæ—one day old. Gravid anopheline females were allowed to lay eggs in the laboratory which hatched out into larvæ. These larvæ were placed into two zinc tubs of equal surface area—usually within six hours of hatching—and 1 per cent. Paris green road dust mixture was sprayed on the surface of the water contained in one of these tubs. The other was left as a control. It was observed that almost all the larvæ were destroyed in six hours in the treated tub, the control remaining

unaffected. The experiment was repeated thrice with similar results, thus indicating that 1 per cent. Paris green when sprinkled over water containing very young larvæ in a limited space is capable of destroying them.

During the course of the earlier experiments in the Mian Mir storm water channel the Paris green road dust mixture was usually sprayed on the entire surface of any one section of the channel selected for experimentation. As it is well known that mosquito larvæ are usually found in much larger numbers along the banks under cover of over hanging grass and vegetation, it was decided to carry out a series of observations to determine the relative density of anopheline larvæ at various distances from the bank of the channel. The channel was 15 feet wide and the average of a series of observations is shown as follows:—

Distance from the bank.			No. of larvæ per dip.
Along the bank	..	..	13
1 ft.	..	..	5
2 "	..	..	4
3 "	..	..	3
4 "	..	..	1
5 "	..	..	Nil.
6 "	..	..	
7 "	..	..	
8 "	..	..	
9 "	..	..	
10 "	..	..	1
11 "	..	..	1
12 "	..	..	3
13 "	..	..	11
14 "	..	..	9
15 " (opposite bank)	..	..	

It would appear from the above results that the maximum density of the larvæ was found just along the bank, and that it decreased rapidly in proportion as the distance between the bank and the centre of the stream decreased. For all ordinary purposes however larvæ were usually found up to a distance of 5 ft. from the bank. This was of great practical importance, since considerable saving in time and money could be made by concentrating along the banks of the water course and using Paris green only up to a distance of 6 ft. from the margins so as to be on the safe side. The rest of the stream including its central portion could be safely neglected provided it were free from vegetation.

#### *Technique of using Paris green.*

The apparatus used in the field experiments was obtained from Signor A. Missiroli, Stazione Sperimentale Per La Lotta Anti-malarica, Roma, Italy. It consisted of a screener, a mixer, a hand-blower, and a knapsack-blower.

#### *Dilution of Paris green.*

For the purpose of these experiments ordinary road dust was collected and sifted through the screener which consisted of a wooden box supported on an iron frame. The box had a hole at the top, a hole at the bottom and a handle on one side. The inside of the box contained a fine sieve. Road dust was introduced from the top and the handle was turned, when finely sifted

homogeneous dust emerged from below which was collected in a container and stored.

*Mixing.*—The mixing was done by means of the mixer. This consisted of a square box to which handles had been attached on either side so that it could be held by two men and rotated easily. For purposes of convenience and uniformity in mixing, one hundred rotations of the mixer were fixed as the standard.

*Distribution.*—In a few preliminary experiments distribution by hand was tried, but was found to be unsuitable as a considerable amount of the dust was wasted. The hand-blower was tried next and it was found that it gave an even spread of the Paris green film and prevented waste by automatically measuring the quantity of the dust applied. The hand-blower is very suitable for dealing with small areas, but for water with large surface areas the knapsack-blower is preferable since it dispenses with the necessity of frequently filling up the container, which is the case when the hand-blower is used; thus effecting considerable economy in the time spent in distribution.

*Quantity.*—As regards quantity it was found that on an average two blows of the hand-blower were required for every square yard of water surface, and that approximately 5 grammes of the Paris green road dust mixture were ejected at one stroke or blow, i.e., 10 grammes of the mixture were distributed per square yard of water surface. In other words 1 gramme of pure Paris green was used for every 10 square yards. In the case of the knapsack-blower it was found that approximately double the quantity, i.e., about 10 grammes, was ejected at one stroke of the blower and consequently only one stroke was required per square yard of water surface.

*Cost.*—As already stated, all the prophylactic material or apparatus used in these experiments was obtained from Italy, and the total cost including duty, wharfage fees, clearing and landing charges amounted to Rs. 202-7-0 at Lahore. The total cost of 21 kilogrammes of Paris green including duty came up to about Rs. 42-0-0. As 10 grammes of pure Paris green is required for 100 square yards of water surface, the cost for an area of this size would be 4 pies, and for an area of 1,000 square yards about 3¼ annas. For collecting the road dust, sifting it and spraying the Paris green road dust mixture on the surface of water a coolie was employed on a pay of Rs. 15 per mensem.

#### SUMMARY.

(1) Roubaud discovered in 1920 that anopheline larvæ being surface feeders could be destroyed by dusting poisonous powders upon water, and used paraform-aldehyde for the purpose. Barber in 1921 used a number of arsenical preparations and finally selected copper-aceto-arsenite. Hackett and others have recently employed it in Europe, America, Palestine, Brazil, etc., for anopheline control.

(2) Copper-aceto-arsenite is also known as Paris green, Schweinfurt green and by variety of other trade names. The sample used in the experiments was obtained from Messrs. G. Siegle and Co., Stuttgart, Germany, and on analysis was found to contain 57.7 per cent. arsenious anhydride.

(3) The field experiments conducted during the months of July, August and September 1928 indicate:—

(a) That an area treated with Paris green remains free of anopheline larvæ until the 3rd day after greening, when very young larvæ make their appearance.

(b) That 1 gramme of Paris green diluted with 99 grammes of road dust—1 per cent. dilution—is sufficient to destroy all anopheline larvæ in 10 square yards of water surface in 24 hours. Culicine larvæ, leeches, tadpoles, etc., remain unaffected.

(c) That 0.5 per cent. Paris green is only capable of destroying a little less than 50 per cent. larvæ in 24 hours.

Therefore, the highest dilution of Paris green compatible with efficiency is 1 per cent. when 100 grammes of this dilution are spread over 10 square yards of water surface.

(4) The laboratory experiments indicate:—

(a) That Paris green does not affect the egg and pupal stages of anopheline mosquitoes.

(b) The Paris green film would not prevent anopheline mosquitoes from laying eggs.

(5) Field experiments indicate that under optimum conditions of temperature, such as usually prevail in the Punjab towards the beginning of autumn, the minimum period of larval development varies from 7 to 8 days. Hence the interval between greening should not exceed 6 days.

(6) Very young anopheline larvæ are as susceptible to the action of Paris green as older ones.

(7) The technique of using Paris green is described in detail.

(8) On an average two blows of the hand-blower employed in these experiments are required for every square yard of water surface. In the case of the knapsack-blower, double the quantity is ejected at one stroke, hence only one stroke per square yard of surface is required.

(9) Paris green is fairly cheap. An area of 1,000 square yards costs only  $3\frac{1}{4}$  annas for one application. This is exclusive of the operating charges.

#### ACKNOWLEDGMENTS.

We have great pleasure in acknowledging our gratitude to Lieut.-Col. C. A. Gill, I.M.S., Director of Public Health, Punjab, for initiating the experiments and for his guidance throughout their course. We are indebted to Major R. C. Malhotra, O.B.E., I.M.S., Assistant Director of

Public Health, Punjab (Technical), Epidemiology and to Dr. R. B. Lal, D.P.H., Epidemiologist to the Government of Punjab for many useful suggestions.

Acknowledgment is also due to Mr. Bashir Ahmed, M.Sc., Officiating Public Health Chemist, for the analysis of Paris green.

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#### CORRIGENDUM.

On p. 691 of our issue for December, 1929, in connection with the article by Major Labernadie and Dr. Andre Zeganadin on the use of a tuberculous methylic antigen in the treatment of external tuberculosis, in the first line of the fourth paragraph, the phrase "(not methylic)" should be deleted. Methylic antigen is used throughout; at first diluted as stated; later in undiluted form. We much regret the mistake.—EDITOR, I. M. G.

## A Mirror of Hospital Practice.

### A SIMPLE TREATMENT FOR NAGA SORES.

By SATYA KINKAR BISWAS, I.M.P.,

Kerkend (Jharia Coal-field), P. O. Kusunda.

NAGA sores are common in Assam as we know from published reports. I find many such cases in this locality during the latter part of the rains. The determining cause is generally some scratch or minor wound, which develops in a few days into a foul, sloughing, deep-burrowed ulcer with profuse discharge. The greyish spongy slough is adherent to the surface and is difficult to remove. Dressings with the usual antiseptics can be applied for weeks without cure. I have found the following form of treatment, which is cheap, very satisfactory.

The ulcer and the surrounding parts are cleaned with soap and warm water. The skin around the ulcer is smeared thickly with vaseline and then pure carbolic acid (phenol) is applied to the ulcer with a cotton swab. The acid must come in contact with the entire surface of the ulcer. The excess of acid is dried up with a piece of cotton-wool. The procedure, though apparently drastic, does not cause much pain.

The smarting pain remains only for a few seconds. After this, a piece of lint with sterile vaseline is put on the ulcer and covered with usual dressings. Thereafter the ulcer is dressed daily antiseptically. In almost all cases the cure is effected in a week or so, but, should the slough reappear, a second application by the same procedure is sure to bring about a cure.

### A CASE OF GEMINATION OF TEETH.

By P. S. KHOSLA, M.B., B.S. (Punjab), L.D.S. (Edin.),  
*State Dental Surgeon, Civil Hospital, Jammu, Tawi.*

GEMINATION is a developmental fusion of teeth or denticles, partially or completely preserving the outline of the constituents.

The condition was noticed in a Hindu male aged about 22 years. As will be seen from the figure of the cast of the lower jaw given below, the fusion is practically complete in this case. The line of fusion is but faintly marked and is indicated by an arrow in the figure, the teeth affected being the left central and lateral incisors of the lower permanent set.



The peculiarity about the case is that gemination appears in the permanent set of teeth, which is a rare thing, it being more common in the case of the deciduous teeth.

The real explanation of the condition is not well known, but it is said to be either an example of atavism, the shortening of the jaws of animals in the process of evolution being concurrent with the appearance of complicated teeth, the result of fusion of two or more normal tooth-germs or of a tooth-germ and a supernumerary tooth-germ, or a result of dichotomy or bifurcation of tooth-germs.

### A CASE OF JARISCH HERXHEIMER PHENOMENON.

By R. C. MAHAJAN,  
*District Medical Officer, G. I. P. Railway, Sholapur.*

I CAME across the undermentioned case in my routine examination of the Railway candidates. I reproduce part of the notes I submitted to the

Principal Medical and Health Officer, on this case.

An Anglo-Indian, male, 32 years of age, of good physique and working as fireman.

#### (a) *Previous History.*—

(1) History of venereal sore (diagnosed to be syphilis).

(2) History of unconsciousness, accompanied by stertorous breathing and loss of control over the sphincters, lasting for a period of 72 hours, after the second injection of 0.45 gms. of Neosalvarsan in February 1929.

(3) On regaining consciousness he noticed a helpless left arm and leg and a distorted right face.

#### (b) *Present Condition, July 1929.*—

(1) The left leg and arm are spastic and rigid. Atrophy or loss of nutrition are not very noticeable. The grip is, however, weak.

(2) The left knee-jerk and ankle clonus are markedly exaggerated, Babinsk's sign present. Upper limb jerks exaggerated. No loss of epicritic or protopathic sensation.

(3) Slight paresis of right face, unequal contraction of pupils, right pupil sluggish in response to both light and accommodation.

### CONCLUSION.

From the above it is clear that it is a case of Jarisch Herxheimer phenomenon, following a Neosalvarsan injection. Harrison states these cases are very rare. I have shown this case to the Medical Association of Sholapur, and no practitioner seems to have come across such a case before. The special features of this case are:—

(1) The patient is a comparatively young man, aged 32.

(2) The phenomenon has supervened on the second injection.

My grateful thanks are due to Dr. P. L. Stallard, Principal Medical and Health Officer, G. I. P. Railway, for kind permission to publish this case.

### A CASE OF DENTIGEROUS CYST. (FOLLICULAR ODONTOME.)

By COLIN McIVER, M.R.C.S., L.R.C.P., D.T.M. & H.,  
MAJOR, I.M.S.,  
*Superintendent,*  
and

NISANATH GHOSH, M.B.,  
*Radiologist, Berry-White Medical School, Dibrugarh, Assam.*

THE accompanying photograph shows the face of a young girl with a tumour of the upper jaw





obvious exciting cause. The rate of growth was not very rapid. The patient came before us on 19th September, 1928.

Condition on arrival:—

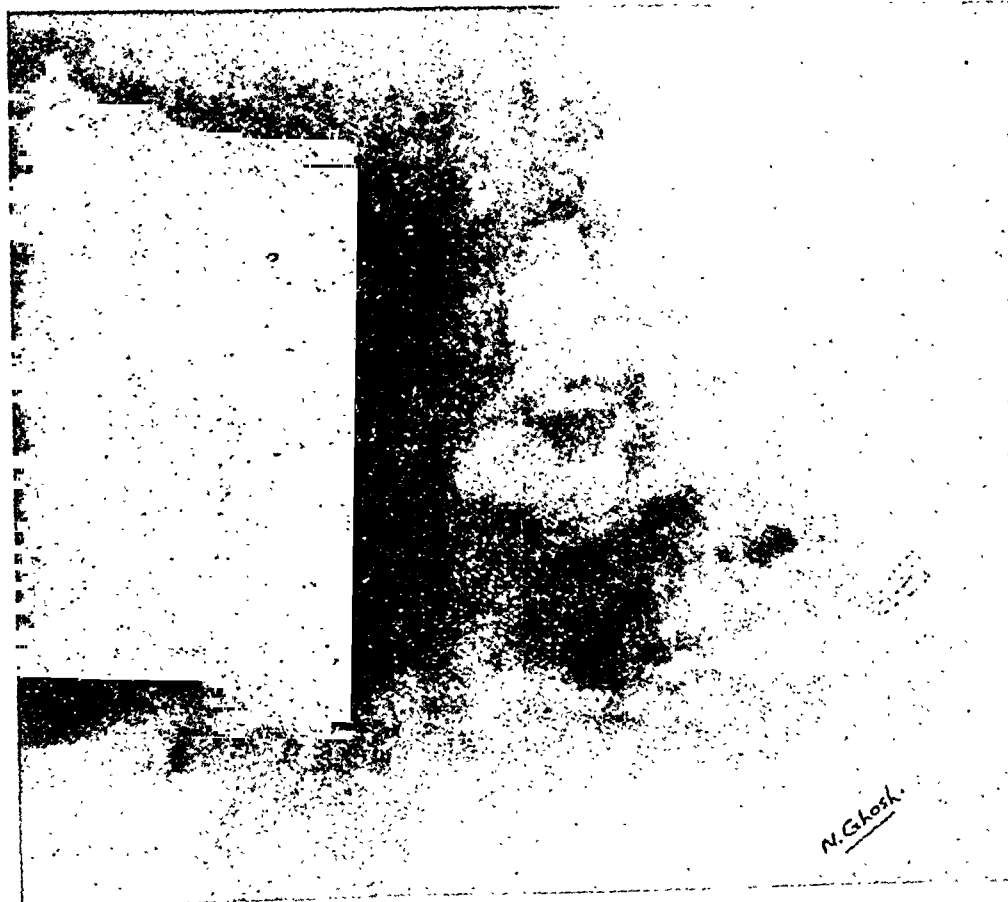
(a) *Local*.—A hard, solid, non-fluctuating tumour with a broad base and obviously fixed to the underlying bone. There was no pain, no tenderness, no heat, no change in superjacent skin, no change in neighbouring lymph glands and no discharge from the nose. The mass projecting inside the mouth at the alveolar margin and the palate was slightly depressed. There was no carious tooth but there was irregularity in the line of the teeth. As the subject was very young it could not be made out with certainty if any permanent tooth was really missing or not.

(b) *General*.—A young girl of fair health aged about 11 years.

(c) *Radiological*.—X-ray examination of the part showed two misplaced teeth, both lying almost horizontally (see x-ray photograph).

Points of interest in this case are:—

(1) Occurrence in the upper jaw—an



which proved to be a dentigerous cyst, but at first sight was rather unlike it. The details of the case are as follows:—

*History*.—The history was of several years duration. The onset was insidious and without

uncommon site for dentigerous cyst, the lower jaw being the usual site.

(2) Establishment of diagnosis by horizontally misplaced teeth discovered by x-rays.

(3) First sight resemblance to sarcoma.

# Indian Medical Gazette.

FEBRUARY.

## THE CHOLERA BACTERIOPHAGE.

THE annual all-India Conference of Medical Research Workers, held in December under the auspices of the Indian Research Fund Association at Calcutta, has now come to be an important function; the Conference in 1929 indeed was attended by 53 delegates from the Government of India and provincial governments and four visitors. At this Conference the most important discussion centred around the present position and future work on the subject of bacteriophage, especially in relation to cholera, and the results are of such interest and importance that we hope that a summary of them may be of interest to our readers.

As Dr. Bentley was careful to explain, the eyes of the world are on India, and on Bengal in particular, with regard to the question of cholera control, for when pandemics originate in Eastern Bengal and do not subside until they reach the Mississippi, public health authorities in countries outside India are apt to take a serious view of the situation, and to call upon India to take measures to control the disease within her borders. That control, Dr. Bentley claimed, can only be affected by wholesale inoculation and a close study of the epidemiology of the disease. In the forthcoming financial year, however, the Indian Research Fund Association has set aside a large sum of money as a provisional measure for the study of the epidemiology of cholera in certain areas, and is advertising for the services of a competent bacteriologist to investigate epidemiological conditions in these areas. The Jharia mines area is one of these which is under very extensive sanitary control and in which detailed information with regard to the population is easily available, it is therefore particularly suited to such an investigation.

Cholera, in brief, is perhaps the most dominant medical research question in India to-day. The 1928 Conference passed the following resolution on this subject:—

"This conference of medical research workers recommends that the whole question of the epidemiology of cholera should form the subject of an enquiry under the direction of a first class expert."

Such a commission can only be built up by degrees, as funds and workers become available, but the work in this direction on cholera bacteriophage is so important that it deserves the widest publicity. A whole morning at the Conference was given to discussing it.

The first speaker was Dr. Igor N. Asheshov, who has taken Dr. d'Herelle's place, and is

working under the Indian Research Fund Association at Patna. Dr. Asheshov has had the great privilege of working in collaboration with Dr. d'Herelle for several years, and has been studying the 'phage for some nine years. He claims, with d'Herelle, that the 'phage is an ultra-minute and living organism, as it can be cultivated and sub-cultivated from tube to tube, just as are the bacteria upon which it feeds. In testing cholera bacteriophages, he has found that there are three strains of 'phage which may be termed A, B and C. Neither A, B nor C 'phage will by themselves, nor will a combination of any two of them, completely lyse a culture of the cholera vibrio on an agar plate; after the initial lysis a "secondary growth" is obtained which consists of vibrios which have acquired a resistance to the strain or strains of 'phage used. When all three 'phages are mixed, however, there is complete lysis, and no secondary growth appears. Experiments with strains of the cholera vibrio from different parts of India would appear to indicate that there are several different antigenic races of this organism—three at least; whilst with regard to the 'phage against dysentery bacilli at least five, and possibly more, different antigenic strains are evident.

By an extremely ingenious line of research work, Dr. Asheshov has been able to determine in any one instance which type of secondary vibrio he is dealing with. Thus type A bacteriophage will destroy the secondary organism which has resisted the action of B and C bacteriophages; type B bacteriophage will destroy an organism which has resisted the action of A and C bacteriophages. This raises the expectation that in any given outbreak the type of primary and secondary vibrios present may be rapidly determined, and also the type or types of bacteriophage needed best to deal with them. Enumerative methods have also been worked out by which it is possible to estimate the strength of a bacteriophage solution in terms of its lytic action on a standard broth culture, using serial dilutions of the bacteriophage, as in carrying out a Widal reaction.

To be effective, therefore, cholera bacteriophage should contain all three elements of types A, B and C. Of these A has the most rapid action, but is unfortunately the most unstable. Types B and C act more slowly, but are much more stable. It is as yet too early to report large scale results, but the 'phage was tried in connection with the annual pilgrimage at Puri in 1929. The results were as follows:—

(a) In the treatment of actual cases of cholera at the Puri hospital results were disappointing. It was only subsequently discovered that the 'phage has these three elements A, B and C, and that the A element is unstable. The difference in antigenic power of the strains of cholera vibrio imported into Puri from different places all over India became apparent on laboratory studies.

(b) In a circumscribed area in the centre of the town, around the main temple, all wells were treated with bacteriophage, and no other measure—the usual measures of treating the wells with permanganate or chlorination being suspended. The incidence of cholera within the protected area was one-tenth of that in the unprotected area.

Once the importance of the A 'phage was realised, further clinical experiments were tried out at Patna Medical College Hospital. Here results were not satisfactory until the whole control and nursing of the patients was taken over by the members of the staff of the enquiry. After this results were extremely satisfactory, the mortality being considerably reduced.

It was found, however, that treatment with saline and alkaline infusions had to be continued; also all bedpans should be sterilised. No anti-septics should be administered whilst the 'phage is being given orally, as they may kill off the 'phage more rapidly than the causative organisms of the disease.

Briefly, the present position reached by Dr. Asheshov's enquiry is that:—

(i) The A type of 'phage is so unstable and delicate that some method of rendering it more stable should be evolved. This has already been partially realised.

(ii) The three essentials which have to be realised if the 'phage method of prophylaxis and treatment are to be successful are that (a) the bacteriophage must be polyvalent against all strains of the true cholera vibrio; (b) it must be rapid in action, producing complete and permanent lysis within two hours; and (c) it must be stable and must retain its activity for at least four to six months under tropical conditions.

It will be seen that Dr. Asheshov's work, whilst of basic and fundamental character, is yet—rightly—directed towards discovering the basic principles underlying the action of bacteriophages, and that so far the application of bacteriophage in the field is still experimental.

Dr. Asheshov's introductory address was followed by a report by Lieut.-Col. J. Morison, I.M.S., Director, King Edward VII Memorial Pasteur Institute, Shillong, on the use of bacteriophage under field conditions. Here no attempt has been made to isolate different strains of 'phage, and a general mixture of strains of both cholera and dysentery 'phages has been used, the idea being to produce a polyvalent remedy. Details with regard to preparation of this bacteriophage are given in a paper in the July 1929 issue of the *Indian Journal of Medical Research*. The polyvalent bacteriophage has been very widely issued throughout Assam during 1929, over 127 litres being indented for. Circular letters and a standardised form of report on results have been issued to tea garden doctors, asking for reports, and these are being collected for analysis and publication. Results with the 'phage in cases of bacillary dysentery have been almost uniformly good. As a prophylactic, 'phage was

tried in one of the Assam jails; of 192 prisoners who received 'phage, 5 developed dysentery; of 169 controls who did not, 28 developed dysentery. In three small localised epidemics of cholera in Shillong, Goalpara, and Salmara 57 cases were treated with 'phage with 15 deaths—mortality 26 per cent.; in the control 92 cases who received no 'phage there were 50 deaths—mortality 54 per cent. In a local outbreak in Jakrem village in the Khasi Hills near Shillong,\* results were as follows:—

	Cases.	Deaths.	Mortality.
<i>General, during the epidemic—</i>			
Without bacteriophage	78	63	80.8 per cent.
Receiving bacteriophage	65	7	10.8 "
<i>Cases falling ill after bacteriophage became available—</i>			
Without bacteriophage	13	12	..
Receiving bacteriophage	59	7	..

Thanks to Col. Morison's energy, bacteriophage treatment and prophylaxis has become almost the rule in bacillary dysentery and cholera outbreaks in the tea gardens in Assam, and it will be of very great interest to study the results.

The third speaker at the discussion was Lieut.-Col. J. Taylor, D.S.O., I.M.S., Director, Pasteur Institute of Burma, Rangoon. Colonel Taylor reported that he had had no opportunity of testing 'phage under epidemic conditions, but he had especially investigated the results with and without 'phage treatment in sporadic cases of bacillary dysentery and cholera. In such cholera cases the 'phage treatment had not improved results as compared with controls, and there had been but little evidence of the development of bacteriophage in convalescent patients. d'Herelle has attributed the natural decline of an epidemic to the development of bacteriophage in the affected individuals and even in the environment, but the results in Rangoon did not support this claim. They applied, however, to sporadic cases, and not to epidemic conditions. Therapeutic administration of the 'phage in cases of bacillary dysentery did not appear to have assisted in recovery, as compared with the control cases.

Major R. H. Malone, I.M.S., reported that he had been investigating the presence or absence of bacteriophage in flies and in well waters in relation to the presence or absence of cholera in villages in the Punjab. Up to date results were inconclusive, though a potent cholera bacteriophage had been found in both flies and wells.

\* We hope to publish Col. Morison's report on this outbreak in our next issue.

It remains to take stock of the present position. It was unanimously agreed that the three major enquiries should be continued during the next financial year, and that Dr. Ashleshev's investigation was of fundamental importance. At present we are so ignorant with regard to bacteriophage that investigation of the fundamental biological principles underlying its use and action are essential. Further trial in the field is also indicated. Its administration is simplicity itself; it is administered orally, preferably on an empty stomach, and no antiseptics should be given orally beforehand or subsequently. Dr. Ashleshev proposes now to replace the ampoules in which phage was previously sent out by ordinary medicine bottles, fitted with a cork, traversed by a fine capillary glass tube. The bottle having been sterilised, it is filled by vacuum pressure with the phage solution through the capillary tube, which is then sealed, and the cork sealed up with melted paraffin wax. In this way a large supply, suitable for repeated administration to individual patients, or for large scale prophylactic use, is readily available. If cholera is at the moment India's greatest public health problem, it will be seen that research work with regard to it is far from being neglected, whilst the summaries of annual reports elsewhere in our columns show that the public health aspect of the subject is also being very closely attended to.

## SPECIAL ARTICLE.

### A REVIEW OF OUR PRESENT KNOWLEDGE OF THE BACTERIOLOGY AND PATHOLOGY OF HUMAN LEPROSY.

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*Introductory.*—The purpose of this paper is to indicate in outline the salient features of the bacteriology and pathology of human leprosy in the hope that the bird's-eye view so obtained may result in the clarification of the ideas of the author, and, we trust, of other workers in the same field, and that fresh avenues of approach to this difficult problem may suggest themselves. There are certain aspects of the subject to which we shall devote merely incidental reference, not, let us hasten to add, because we have the impertinence to arbitrate on the validity or otherwise of any or all of the observations comprehended in the particular aspect or aspects in question, but merely because the observations have not received that unanimous confirmation which is a necessary condition to their acceptance as scientific facts. Such important but still highly controversial topics as the cultivability of the organism of human leprosy, the rôle of insect vectors in the spread of the disease, the transmission (successful or otherwise) of human leprosy to lower animals, and the relationship of human leprosy to rat leprosy, will so far as possible be omitted from the present discussion. That there is at times a lamentable lack of unanimity of opinion even in those aspects of the subject to which we shall confine ourselves, will, we fear, become only too obvious to the reader. This is doubtless unfortunate, but the authorities quoted are such that due regard must be paid to their (at times

divergent) findings. Any other plan would, we feel certain, result in the degradation of this conspectus to the level of an ill-timed expression of personal opinion. The plan that we have followed is to condense each section of the subject as far as possible and to give in the appropriate section of the bibliography a full list of references so that those interested in particular aspects may be provided with a large number of original sources.

#### Bacteriology.

There is a general consensus of opinion that human leprosy is due to the organism first described by Armauer Hansen in 1871 and now called *Mycobacterium lepræ* (Hansen), or, more familiarly, "the leprosy bacillus" or "Hansen's bacillus." The well-grounded belief in this organism as the cause of leprosy depends on the repeated observation by workers all over the world of its presence in greater or smaller number in all leprosy lesions. Final proof by animal inoculation with the production of lesions in all respects similar in course and in histological appearances to those occurring naturally in man is still, however, lacking.

The type morphology of the organism is that of a uniformly stained rod, straight or slightly curved, varying in length from 1.5 to 6.0  $\mu$  and in breadth from 0.2 to 0.45  $\mu$ . In highly positive lesions the organisms are present in very great numbers and they show a distinct tendency to be arranged in bundles of greater or smaller size; in weakly positive lesions this feature is not present.

Variations from the type morphology are frequently met with; in general these fall under three main heads, and they may occur either singly or in combination. (a) The organism may show a fragmented appearance with unstained gaps throughout its length. (b) Deeply staining particles, varying in size, number and position may occur in the bacillary protoplasm. The word "spore" is sometimes used with reference to these deeply staining inclusions—without any adequate justification in the present state of knowledge. (c) The organism may manifest alterations of different degrees in its characteristic acid-fast property, combined not infrequently with departures from the type bacillary form.

The significance of these aberrant forms is not certainly known, but there is a general impression that they occur most commonly and in relatively greatest numbers in patients who are passing from the infective to the non-infective stage of leprosy, and that the appearance of unstained zones in the body of the organism represents the first stage in a degenerative direction.

*Cardinal features of *M. lepræ*.*—The organism of human leprosy has five cardinal features. (1) It is, in general, acid-fast. (2) It grows on artificial culture media with difficulty or, as certain workers maintain, not at all. (3) Its pathogenicity is low. (4) Introduction of this organism to laboratory animals has not so far resulted in the production of progressive lesions at all comparable to those of the naturally acquired human disease. (5) Ordinary methods of examination frequently fail to reveal *M. lepræ* in certain types of lesion which are clinically leprotic in nature.

(1) *The acid-fast property of *M. lepræ** is mainly relied on for the recognition of this organism in the tissues, and the well-known Ziehl-Neelsen technique is commonly employed; incidentally the application of heat is not essential. The reason for the acid-fastness of the organism is not known: the property in question is usually referred (somewhat vaguely) to the supposed waxy "coat" or "capsule" possessed by the organism. Wade, however, strongly refutes this view, and believes that the acid-fastness is due to "lipins" which are combined in the bacillary protoplasm with proteins as lipoproteins, and the demonstration of these in the body of the organism has recently been effected by Paldock (1927, 1927a, 1927b). That *M. lepræ* shows variations in the degree of resistance to decolorization by mineral acids is an experience common to all leprologists, and this even when a constant technique is employed. In

general, lesions tending to undergo resolution show less resistance to acids on the part of their contained organisms which, therefore, take up more of the counter-stain. Hence one may get red, violet, and blue bacilli in the same preparation. This loss of the acid-fast property is also seen in microscopic preparations which have been kept for some time; the bacilli in these tend to fade rather quickly in a tropical climate, particularly if the mounting media are on the acid side of neutrality.

The majority of workers are in agreement that *M. lepræ* cannot be separated from other members of the acid-fast group by differences in staining properties only. Rudel (1928) however in a recent paper claims that by his method, a modification of the classical Ziehl-Neelsen technique, he can differentiate leprosy from tubercle bacilli. *M. lepræ* is also demonstrable by other methods of staining, but none of these can challenge either in reliability or in ease of application the Ziehl-Neelsen method.

(a) The organism is stainable by the Gram method or one of its modifications, especially if (as shown by Arning and Lewandowsky) the violet stain is allowed to act for forty-eight hours: the organism is Gram-positive.

(b) It is also stainable by osmic acid (a few hours' application), being coloured faint brown; this is Hansen's original method.

(c) Prolonged application of many basic aniline dyes (fuchsin, methyl and gentian violet, methylene blue, vesuvin, nigrosin, aurantia, and malachite green) succeeds in staining the organism, and it is also demonstrable by silver impregnation methods.

(d) Mention should also be made of the staining methods advocated by Unna (1906) mainly because these methods do not appear to have been at all extensively tried out.

(I) Unna's thymen victoria blue-safranin method, by which it is claimed that living organisms stain dark blue-black, and dead reddish-yellow.

(II) Unna's polychrome methylene blue-potassium ferricyanide method whereby a "coccothrix" form of the organism is stated to be capable of demonstration.

As noted above neither of these methods seems to have been tried out at all extensively and it would appear desirable that this should be done. The present author has been using both methods lately—but so far without satisfactory results. The time devoted, however, has been too short for the expression of a definite opinion and this line of work is being continued. It would be advantageous if other workers would pursue the same path so that some sort of collective opinion may be obtained. Neither method from its length is suitable, however, for rapid diagnostic work.

*M. lepræ* has not so far been demonstrated by intravital staining methods.

(2) *The question of the artificial cultivation of M. lepræ* is one of the most difficult in the whole range of leprosy problems, for in spite of painstaking researches by numerous competent workers this question has still not left the realm of the debatable. It is closely bound up with the allied question of the production of human leprosy in experimental animals and until this latter object has been achieved it would appear difficult to determine whether any given culture is or is not *M. lepræ*. It is not our present purpose to discuss this subject: those interested will find adequate accounts of various aspects in the papers of Kedrowski, Van Houten, Rost, Emite-Weil, Clegg, Duval, Beauchamp Williams, Fraser, Bayon, Currie, Clegg and Hollmann, McCoy, Marchoux and others (see bibliography), as well as in the textbook of Rogers & Muir and in Kolle & Wassermann's *Handbuch der Pathogenen Mikro-organismen*.

(3) *The low pathogenicity of the bacillus of leprosy* is an observation which has been made clinically by all who have studied the disease with care. There is probably no other systemic disease in which the specific organism may be present in such vast numbers without giving rise to much graver general signs and symptoms. It is, we think, a fortunate circumstance that the infectivity of the bacillus of leprosy is also, generally speaking

low; for in any endemic area there are large numbers of "carriers" going about their ordinary avocations without grave discomfort and at the same time disseminating the infection broadcast from the skin and nasal mucous membrane.

Further evidence on this point is available in the mortality statistics of leper asylums and hospitals. Pineda (1924) in his studies at the Cullion Leper Settlement, Philippine Islands, showed that in only 2.3 per cent. of three hundred autopsied cases could leprosy be assigned as the cause of death. In the experience of the Philippine workers tuberculosis and nephritis are the two commonest causes of death in the lepers under their care.

(4) *Animal inoculation.*—The literature on animal inoculation with human leprosy material is nearly as extensive as the literature on the cultivation of the bacillus of leprosy, and a perusal of it leaves the reader with the same feelings of dissatisfaction and dubiety. Results of a kind have been obtained in that proliferation or, as certain sceptical critics have insisted, survival of organisms at the site of inoculation has taken place, but there is no well authenticated instance of the production in any animal of a condition resembling the naturally acquired human disease. A large series of experiments on monkeys, rats, guinea-pigs, Chinese hamsters, Japanese dancing mice and Belgian hares has been in progress at the School of Tropical Medicine and Hygiene, Calcutta, during the past eight years but the results have been in our opinion negative and unworthy of publication. Practically all animal experimental work (including our own) suffers from one serious impediment, namely that the inoculum consists not of the specific organism alone but of the specific organism plus human tissues or tissue juices, resulting obviously in the introduction into the experiment of an unknown factor of possibly large dimensions. The literature on animal inoculation with human leprosy, leprosy material, unsatisfying though it is, is important and I have therefore included in the bibliography a list of the more important and accessible papers.

(5) *Inability to find the specific organism in lesions* which are on clinical grounds considered by competent leprologists to be of truly leprotic origin is one of the most puzzling features of the disease. That such failure should be encountered in the late trophic manifestations of the disease is perhaps not to be wondered at; such lesions are of the nature of scars—they are evidence not of present but of past disease. The problem becomes more complicated, however, when one fails to find the specific organism in lesions which one is accustomed to regard as early manifestations of the disease, e.g., the so-called macules. There is, however, one point to which investigators in general have not paid sufficient attention, viz., the time factor. If, for example, one were to examine a "macule" which had persisted in a stationary condition for a number of years one would be tolerably surprised to find the specific organism—such a lesion is a scar of the disease just as much as the trophic lesions alluded to above. It does not seem to have been fully realized even yet that, as Impey (1895), Muir (1924) and others have insisted, leprosy is a self-limiting disease.

Leaving aside these objections, however, the majority of workers are in agreement that the acid-fast bacillus of leprosy as we know it is very rarely found in leprosy "macules." Two possible explanations suggest themselves; (1) that the specific organism has died out of the lesions by the time one gets an opportunity to make a microscopic examination, and that it would be detected in every macule if one were on the fortunate position of being able to examine serial sections of such a lesion within a few days of its appearance; (2) that the early leprosy lesion is due to a stage (presumably non acid-fast) in the "life cycle" of the organism which has not been made manifest by our present methods of staining.

With a view to gaining insight into the latter possibility the present author has during the past six months examined several hundred sections of early depigmented

patches, using a great variety of staining and impregnation methods with, at the moment, completely negative results. One is of course up against the supreme difficulty of having to rely almost entirely on the necessarily faulty memory of the average out-patient for the interpretation of the word "early."

### Pathology.

*The initial lesion in leprosy.*—The problem of the initial lesion in leprosy is one which even yet cannot be considered settled. Danielssen (quoted by Hansen) stated that he had seen, at the very beginning of the disease "a slight vaso-motor disturbance indicated by a bluish-red reticular appearance, most clearly marked on changes of temperature." Sticker (1897) having found acid-fast bacilli morphologically similar to *M. lepra* in the nasal secretions of 128 cases of leprosy out of a total of 153 examined, concluded that the nasal mucosa is the seat of the primary lesion. The value of this observation has been largely discounted by the later work of McDonald (1903) and of Brinckerhoff & Moore (1909) in Hawaii, and more recently of Wade & Solis (1927) in the Philippines.

In Sticker's original paper there is no accurate account of the clinical condition of each member of the group of patients examined, and it seems probable that his sample was unduly weighted by the inclusion of a large number of advanced nodular cases in whom positive nasal findings are, of course, common. There is, however, one type of case in which the nasal mucosa may be the seat of the primary lesion, namely, the type in which the onset of the disease is of an explosive nature and is heralded by the simultaneous appearance of multiple lesions at different parts of the body surface.

Modern opinion tends to view leprosy as a disease acquired by inoculation through the skin following prolonged and intimate contact with a patient in a highly infectious stage of disease. Muir in particular is emphatic on the importance of resistance-lowering factors (coincident diseases, bad hygienic conditions and lack of exercise) in the propagation of leprosy. The intimate nature of the resistance of the body to disease is bound up with the nature of the life-processes themselves.

*The nature of the "specific cell response" in leprosy.*—Uncertainty still exists with regard to the exact nature of the cellular response to invasion of the tissues by *M. lepra*. That the cell which can be found proliferating in all active leprotic lesions (and which, having undergone a lipid degeneration and become crammed with *M. lepra* is then denominated the "lepra cell") belongs to the group of macrophages, is recognized by nearly all modern workers. The question of the origin of the macrophage cells of the connective tissue is, however, one on which sharp cleavage of opinion exists among cytologists. Briefly there are two schools: (a) those who believe with Mallory (1914), McJunkin (1925a) & Foot (1919) (1925), Sabin, Doan & Cunningham (1925) that the whole or part of this highly phagocytic group of cells is derived from endothelium of vascular or lymphatic origin, and (b) the opposite school of thought led by Aschoff (1924) and Maximow (1928) who deny that the cells of true endothelium can ever have a phagocytic function and who maintain that the macrophages of the subcutaneous tissues are all constituents of the reticulo-endothelial system, or system of histiocytes. The whole question, although interesting from the purely cytological point of view, appears to be somewhat academic from the point of view of leprosy.

*The pathology of leprotic skin lesions.*—This subject is dealt with at considerable length in various textbooks of skin diseases and in numerous papers; reference to the more salient features is alone required.

(A) The earliest type of skin lesion histologically speaking, is that known among European workers as the *macule*, and among Indian and African workers as the *depigmented patch*. Histologically there is evidence of a mild chronic inflammatory process in the corium, and the cell proliferation incidental to the inflammatory process shows in the earliest cases a predilection for certain sites—the papillae of the corium, the subpapillary and

deep lymphatic plexuses and the areas immediately surrounding the hair follicles, the sweat and sebaceous glands. The cells concerned in the proliferation are mainly of three types: (1) the macrophage (of connective tissue or possibly of endothelial origin); (2) the lymphocyte; (3) the young connective tissue cell or fibroblast. The extent to which each of these cells takes part in the process varies in different cases, but a feature of interest is the comparatively slight response of the tissues to the invasive process. Irregularities of cornification are occasionally noted and an increase in the numbers of "mast" cells is not uncommon. Acid-fast bacilli are rarely found. Partial loss of pigment is a prominent clinical feature when such lesions occur in dark-skinned races and this loss can sometimes be detected by subjecting skin sections to silver impregnation: but the results are rather irregular.

(B) In the next type of skin lesion, representing a transition stage between the macule (or depigmented patch) and the "nodule," there is much greater activity both on the part of the invasive process and of the defence elements of the corium. Microscopically the cell elements are—with one exception—similar to those already noticed in connection with the depigmented patch but the extent of corium involved is much greater. Masses of macrophage, endothelial-like-cells can be seen infiltrating the corium in all directions, but these masses tend to be broken up into more or less isolated foci by circumscribing collections of lymphocytes and young connective tissue cells. The appearances presented therefore are not unlike those seen in non-caseating tuberculous follicles and the similarity is further heightened by the very frequent presence of giant cells in this type of lesion. The introduction of the term "tuberculoid" is unfortunate; that the changes described can occur without the intervention of a secondary tuberculous infection is agreed by all workers whose experience of leprosy is at all extensive. New-formed blood vessels can be detected, and these doubtless account for the erythema which is a prominent clinical feature of such lesions, and for the infrequency with which caseation is encountered. In sections stained by Van Gieson's method or subjected to silver impregnation the degree of young fibrous tissue formation is well brought out. Acid-fast bacteria, although more frequently encountered than in the true macule, are relatively scanty.

(C) The best known and most frequently described lesion of the skin is the *leprotic nodule*.\* The "nodule" may be single or multiple, circumscribed or diffuse—the last mentioned distribution occurs most frequently in the skin of the face and forehead where it gives rise to the so-called leonine facies. Pathologically the "nodule" is evidence of a virulent infection of the skin by *M. lepra*: in early cases it consists of a mass of macrophage cells crammed full of acid-fast bacilli swamping the corium in all directions and leading to extensive obliteration of normal histological landmarks. Hair follicles, sweat and sebaceous glands are destroyed, the epithelium is reduced to a thin layer covering the dense cellular mass, and the papillae of the corium are flattened out. Apart from the thinning-out process the epithelium appears to suffer little change, and bacilli are very rarely detected in it unless it has ulcerated; the strip of corium immediately underlying the epithelium is also relatively unaffected by the bacillary and cell invasion.

The macrophage endothelial-like cell is, in young nodules, the most prominent of the various cell elements, but it has undergone certain radical changes in appearance from those seen in the previously described types of skin lesions. The most obvious change is that practically every cell of this class is now crammed with a felted mass of acid-fast bacteria so that the number of these organisms in a single microscopic field is often uncountable. The nucleus is pushed to one side and the protoplasm has a vacuolated foamy appearance; the

\*Many of the lesions defined somewhat loosely as "nodular" are, however, better described as diffuse lepromatous infiltrations.



macrophage cell presenting these appearances is frequently known as the "lepra" cell. In older "nodules" a variable amount of fibrosis is seen, not infrequently in the form of vertical strands from the underlying subcutaneous tissue; pseudo-myxomatous degeneration may occasionally take place.

(D) *Embolic lesions.*—During the phase of leprous reaction there may occur, either in previously healthy skin or in an area of skin already the seat of a leprous lesion, small hyperæmic foci slightly raised above the general cutaneous surface. Microscopic examination reveals that these lesions are the result of blocking of the fine skin capillaries by small emboli of *M. lepræ*. There occurs a slight degree of blood vessel dilatation in the immediate vicinity together with œdema of the neighbouring connective tissue, proliferation of endothelial-like cells and occasionally slight diapedesis of red blood corpuscles. In favourable cases *M. lepræ* singly or in small clumps may be noted in the endothelium of the blood vessels, lying free in the dilated lymph spaces, or enclosed in endothelial-like cells. These lesions are, as a rule, very transient in duration and may completely disappear in the course of a few days. Where "embolisation" has occurred in a pre-existing lesion, the differentiation from the phase of reaction occurring in that lesion is often impossible.

(E) The end result of the proliferation of leprous granulation tissue in the skin is the formation of fibrous tissue and the production of atrophic skin lesions. The most important of these is the so-called *crushed tissue paper skin*. Clinically the skin is thin, dry, shiny, hairless and lacking in elasticity. Microscopically there are small foci of cellular accumulation separated by dense strands of fibrous tissue with thinning and irregularity of the epithelium, obliteration of hair follicles, sweat and sebaceous glands, and widespread destruction of elastic tissue. Acid-fast bacteria—usually granular degenerating forms—may be present in small numbers: in very old-standing cases, however, they are not infrequently absent.

Any of these types of skin lesion, with the possible exception of the last, may be modified both clinically and pathologically and at any stage in its evolution by the onset of a general systemic disturbance known as the leprous reaction or "lepra fever," a condition to be described in a later section.

#### *The so-called "immune areas" of the body surface.*—

Although leprosy may involve any part of the skin surface, there are certain areas which, in the experience of the majority of workers, are less commonly involved than others; such are the hairy scalp, the glans penis, and the palms of the hands and soles of the feet. A search of the literature reveals, however, that contrary to the positive statements of Hansen, Danielssen, Unna and others regarding the almost complete "immunity" of such areas from leprous lesions, positive findings are not uncommon. As early as 1900 Morrow reported a case of nodular leproide of the scalp, while Glück in the same year found lesions of the glans penis in no fewer than ten out of forty patients examined. Rille, in the following year gave a very detailed report of a case of "tuberous leprosy" with lesions of the soles of the feet. Rogers and Muir, while agreeing on the comparative rarity of leprous lesions of the scalp, state that they have found *M. lepræ* in the corium of the palms and soles of the majority of patients suffering from advanced skin leprosy. In a patient of the Albert Victor Leper Hospital, Calcutta, in whom diffuse nodular infiltration of the skin of the forehead was present, the present author detected *M. lepræ* in an apparently healthy portion of skin removed from the scalp over the vertex, while in a recent case at the Leprosy Out-patient Department of the School of Tropical Medicine and Hygiene, Calcutta, a well marked erythematous lesion of the back of the neck was noted to be extending on to the hairy scalp in the occipital region.

Further evidence bearing on the occurrence of definite leprous lesions in one or other of the regions mentioned has been submitted by Robelin (1901), Bjarnhjedinsson (1905), Pernet (1905), and more recently by Neff and Snodgrass (1929).

It is probable therefore that leprotic involvement of these regions is more common than had hitherto been supposed.

#### *Leprosy of the nervous system.*

(1) *Sensory nerve endings.*—That *M. lepræ* may occur in the fine nerve terminals of the skin, and in the cornea, has been established by the researches of Unna, Lie, Hansen, Babes, and others.

Even where the skin is apparently slightly involved, examination of appropriately stained sections may reveal thickening of the nerve terminals and occasionally the presence of scanty acid-fast bacilli in the perineurium or in the lymphatic channels immediately around the nerve endings.

(2) *Nerve trunks.*—Clinical evidence of involvement of certain nerve trunks is a commonplace of leprosy practice. The nerve trunks most frequently affected are the ulnar, the internal cutaneous of the forearm, and the radial, in the upper extremity, the external peroneal in the lower extremity, and the great auricular, the facial and the supra-orbital in the head. The changes which take place in the nerve trunks are very similar in kind to those in the skin and are frequently co-existent and contemporaneous with the latter. They consist in brief of an insidious production of leprous granulation tissue within the supporting connective tissue sheaths and septa of the nerve, followed by fibrous organization of the granulation tissue with pressure atrophy and sclerosis of the true nerve fibres. In the beginning therefore the clinical picture is that of nerve fibre irritation—hyperæsthesia, tingling and neuralgia, followed by loss of the sensations of pain, superficial touch and temperature discrimination, and terminating in signs and symptoms of constriction and degeneration of nerve fibres, as manifested by muscle atrophy, deformities of digits and the formation of trophic ulcers. The cellular elements taking part in the nerve lesions are very similar to those already noted in connection with the pathology of skin leprosy.

In very early cases Wade and Rodriguez (1927) maintain that there may be no abnormality other than an irregular increase of the connective tissue surrounding the nerve; in well marked cases, however, lymphocytes, macrophage endothelial-like cells, fibroblasts and new formed fibrous tissue can be detected in varying proportions. The occurrence of giant cells in leprotic nerves has been noted by Arning, the present author (Henderson, 1928) and others. As in cutaneous lesions, the clinical signs and symptoms and the microscopic appearances may be altered by the onset of a "leprous reaction." *M. lepræ* when present are found, not only in the macrophage cells of the granulation tissue, but also free in the lymph spaces between the nerve fibres and (according to Hansen) in the cells of Schwann's sheath.

A curious complication of nerve leprosy to which Arning, Glück, Shiota and more recently Muir (1924) and Lowe (1929) have drawn attention is the occurrence of nerve abscesses. In almost every case reported this complication has been found in one or other of the nerves of the upper extremity. (Muir and the author, however, recently saw a patient at the Leprosy Out-patient Department, The School of Tropical Medicine and Hygiene, Calcutta, in whom an abscess was found in the trunk of the posterior auricular nerve; scanty *M. lepræ* were found in the abscess material. This case is, in our experience, distinctly rare). The abscess usually consists of white cheesy semi-solid material containing cellular debris, and occasionally a few degenerated acid-fast bacilli. Lowe is of opinion that the occurrence of this complication is intimately associated with the onset of a "leprous reaction."

(3) *Spinal cord.*—Whether true leprotic changes occur in the spinal cord (and in the ganglia of the posterior roots of spinal nerves) has been a subject of considerable controversy. Soudakewitsch was among the first to demonstrate *M. lepræ* in the spinal ganglia, and his findings were confirmed and amplified by Babes; the latter worker in addition found *M. lepræ* in considerable numbers in the cells of the anterior horn of the spinal

cord on nine occasions in twenty-two autopsies. Positive bacteriological findings in the spinal cord and spinal ganglia have since been reported by numerous workers—Chassiotis, Cotella and Stanziale, Kalindero Lie, Uhlenhuth and Westphal among others, associated in practically every instance with generalized and highly positive leprotic lesions in other organs and tissues of the body.\* In pure nerve leprosy (so-called) examination of the spinal cord is usually negative.

The histological changes most commonly found are sclerosis of the posterior columns of the cord, degeneration of the ganglion cells of the anterior and posterior horns, and occasionally bilateral sclerosis of the lateral columns. Jeanselme and Pierre Marie (1898) describe a sclerosis of Goll's column and of the "cornu-marginal triangle" existing with a minimum of alteration in the posterior roots and in Clark's column, which they conclude to be of true leprotic endogenous origin and independent of coincident involvement of nerve trunks. Rogers and Muir on the other hand, while admitting that spinal cord lesions may occur in leprosy, do not consider such lesions to be connected directly with leprosy invasion. They are therefore in agreement with Voit (1900) who declared that whatever degenerative changes are found are due to the chronic cachexia induced by the disease.

(4) *Brain, meninges and cerebro-spinal fluid.*—*M. lepræ* have been discovered in the brain in advanced cases of generalized leprosy by numerous authors. Uhlenhuth and Westphal in particular describe and figure the organisms in the cells of Purkinje: the histological changes are usually unimportant. So far as the meninges are concerned there are few characteristic appearances; Doutrelepon and Wolters found *M. lepræ* in the pia mater and Brulzer in the dura over the hypophysis cerebri. De Buermann and Guy Laroche have described a localised meningitis with many acid-fast bacilli in the exudate occurring in cases of acute generalized leprosy. In the cerebro-spinal fluid acid-fast bacilli have been detected by Emile-Weil and Tarron and by Jeanselme and Milian.

Major psychoses and psycho-neuroses may occur in association with leprosy, but it is doubtful whether the disease plays any direct part in ætiology. Hansen and Looft described a case of recurrent mania in association with leprosy. De Buermann, Roubinovitch and Gougerot (1906) draw attention to the occurrence of a "psychic toxæmic cerebropathy" in leprosy characterized by anterograde amnesia, defective attention, volition and judgment and in severe cases by hallucinations and systematised delusions.

*Bone and joint lesions in leprosy.*—Atrophy of bones, particularly the small bones of the hands and feet, first noted (according to Hansen) by Heiberg as occurring in association with leprosy, is frequently seen as an end stage in the disease process. If complicated, as it not infrequently is in the lower extremities, by ulceration of the overlying skin there may occur periostitis with necrosis of bone, sequestrum formation and exfoliation. Hudellet and Moreau (1925) record partial decalcification of the bones of the hand as a constant radiographic finding; this observation they hold to be of value in the diagnosis of early cases. Sawtschenko Doutrelepon and Wolters and Uhlenhuth and Westphal have reported the presence of *M. lepræ* in the Haversian canals and in leprosy nodes in the bone substance.

Acute rheumatoid affections of the joints, particularly those of the knee and ankle and the small joints of the hands and fingers with collections of fluid in the joint cavities may occur even at a relatively early stage in the disease. After several attacks of this nature changes in the joint capsule and ligaments may be noted, according to Hansen such joint affections are of the nature of trophoneurotic vaso-motor disturbances.

*Leprosy of the lymphatic glands.*—Involvement of lymphatic glands, particularly the femoral, inguinal, and axillary groups, less commonly those of the anterior triangle of the neck and the epitrochlear gland at the elbow, is a frequent finding in leprosy. The histological appearances and the facility with which acid-fast bacilli can be recovered vary according to the type and stage of the disease, while the former are further complicated by the periodic changes undergone by lymphatic tissue in performing its physiological function of lymphocyte production.

Wade has drawn attention to the frequency with which lymph glands act as reservoirs of *M. lepræ* and has further emphasised the fact that the degree of gland involvement does not depend on the extent of coincidentally infected skin in the area drained. The former observation has been further elaborated by Pineda (1927) and the present author (Henderson, 1927). The former worker found *M. lepræ* in the femoral glands of 9 out of 53 patients in whom repeated examination of the skin extending over a period of two years had been consistently negative. He also records positive findings on five occasions in eleven autopsies carried out on patients who had been bacteriologically negative on skin examination for periods ranging from five to seventeen months. The present author in an examination of the femoral glands of 93 patients found *M. lepræ* on 27 occasions. Simultaneous examination of skin smears gave negative results in 66 out of the total 93, and of the 27 positive gland findings 4 occurred in this negative skin group. Gland puncture only was employed and hence the positive findings are probably on the low side; this is further emphasised by the fact that microscopic examination of an excised gland found negative on puncture a few days previously revealed undoubted *M. lepræ* in small numbers.

The frequency with which double infection, usually with tubercle bacilli, may occur in leprotic lymph glands has been remarked by various workers. McCoy (quoted by Muir) found combined infection in the lymph glands on 10 occasions out of a total of 650 examinations. Rogers and Muir record the occurrence of a gland abscess in a patient suffering from leprosy; acid-fast bacilli were found in the pus from the abscess, and this material on inoculation into four monkeys caused fatal miliary tuberculosis in all the animals. The present author (unpublished observation) found on one occasion by microscopic examination a mixed infection of leprosy and filariasis in a lymphatic gland from the groin. It is probable that systematic examination of our patients in India would reveal such a mixed infection not infrequently.

The possibility of leprosy lying latent in lymph nodes prior to declaring itself on the skin surface, in nerve trunks or in the body generally, has been explored by various workers, and in particular by Marchoux (1923). In this connection it is of interest to note that Sorel (1912), examining a group of 15 presumably healthy persons living in contact with leprosy patients, reported positive findings in the lymph glands of 1. Conoy (1914) found *M. lepræ* in the "genital ganglia" of the healthy wife of a leper, while Serra (1926) reported positive findings in the lymph glands of all of 12 apparently healthy commensals of lepers.

#### *The special sense organs in leprosy.*

(1) *The eye and adnexa.*—Involvement of the eye and its adnexa is not uncommon in leprosy, but the frequency with which eye complications occur differs in the experience of various observers.

Lyder Borthen (1899), studying this question in Norway, found complete blindness in 17 per cent. of 277 lepers examined. Wood (1913) in South Africa records eye involvement in more than 50 per cent. of "anæsthetic" cases and states further that 90 per cent. of "tubercular" cases suffer from eye complications in the first ten years of the disease, and that "nearly all who survive longer are blind."

Higbet (1918) found eye lesions in 77 out of 101 Chinese lepers in Siam, while Fernando (1923) in the Philippines noted the occurrence of such lesions in

\*The fact that *M. lepræ* may be present in relatively large numbers in the circulating blood of advanced "skin" cases, particularly during the phase of reaction should be borne in mind in assessing the value of these observations.

increasing numbers with the duration of the disease "from 95 per cent. in advanced cases of 15 years' duration to 21 per cent. among those of 8 years' duration." The experience of Rogers and Muir and of Van Driel (1923) is in rather sharp contrast to that of the workers just quoted. Rogers and Muir from their studies in India are of opinion that "not more than 5 to 10 per cent. of cases of skin leprosy have any disease of the eyes and adnexa caused by leprosy." Van Driel in an examination of 1,300 patients in the Dutch East Indies found complete blindness due to leprosy in only 0.5 per cent. Superficial punctate keratitis, usually mild, was found in 3 to 4.3 per cent., while involvement of the iris was noted on 79 occasions (about 6.1 per cent.).

The eye may be involved in leprosy in one or other of two ways: (a) by lymphatic or blood spread from an active lesion, usually in the vicinity, (b) as a result of abolition of corneal or conjunctival sensation from involvement of the superior maxillary division of the fifth cranial nerve or of paralysis of the orbicularis oculi from involvement of the facial nerve. Different appearances are presented according to the extent of involvement of the various structures of the eye; in cases of eye involvement secondary to blood or lymph spread from a near by focus conjunctivitis, keratitis with pseudo-ptyergium formation and iridocyclitis are the common findings; while in the nerve type of cases we have ectropion, epiphora, corneal ulceration and leucoma and occasionally panophthalmitis. Contrary to the findings of later workers Hansen and Looft described leprosy lesions in the *pars ciliaris retinae* with infiltration of the ciliary nerves. Kirwan (1927) in Calcutta has lately described the slit-lamp appearances in leprosy eyes. According to this worker true iris leprosy is seldom if ever found; the "nodules" of the iris which are sometimes seen are due to exudation. He admits, however, that examination of the iris is difficult owing to corneal implication.

Leprosy lesions in the eye as in other parts of the body may be altered and intensified by the onset of a leprosy "reaction": the exacerbation of eye lesions during the phase of reaction is a complication at once dangerous and difficult to overcome.

(2) *The nose and throat.*—The possibility of the nasal mucosa being the site of the initial lesion in leprosy has already been discussed. The portion of the nose most commonly affected, at least in the early stages, is the mucosa covering the anterior part of the septum and the front of the lowest turbinate bone. Making allowances for the differences in structure of the two areas, the changes that occur in the nasal mucosa are similar in kind to those found in the skin; ulceration with discharge of large numbers of *M. lepræ* is the common sequel of nodule formation in the nasal cavity. Hansen and Looft maintained that the nasal bones are never affected in uncomplicated cases of leprosy. Destruction of the cartilaginous septum in leprosy patients in whom syphilis could be confidently excluded has, however, been reported by Glück, Engel Bey and Rogers and Muir. Wade and Solis (1927), while doubting the rôle of the nose as an important site of the primary lesion in leprosy, call attention to the fact that the infection may persist longer in the nasal mucosa. Examination of the nasal mucosa of 570 patients in whom the skin had become bacteriologically negative under treatment resulted in recovery of *M. lepræ* on 55 occasions (9.6 per cent.).

Infiltration of the epiglottis, arytenoids and false vocal cords may occur in severe nodular cases of leprosy; ulceration may follow and stenosis of the larynx is not unknown.

(3) *The ear.*—Apart from the very common infiltration of the skin of the pinna and lobule in advanced cases there are no changes in any of the divisions of this organ characteristic of leprosy.

#### *The blood in leprosy.*

A not inconsiderable fraction of the literature on the pathology of human leprosy is devoted to the examination of the blood in this disease. We propose to discuss the subject briefly under the following headings:—

(1) Changes in the morphology, numbers and staining reactions of the cellular constituents of the blood.

(2) Serological changes: (a) Variations in the plasma and serum proteins. (b) The presence of specific antibodies to *M. lepræ*. (c) Variations in the physico-chemical constitution of the blood. (d) The Wassermann and Kahn reactions in leprosy.

(3) Changes in the non-protein constituents of the blood.

(4) The presence of *M. lepræ* in the circulating blood.

(1) *Changes in the morphology, numbers, and staining reactions of the cellular constituents of the blood.*

So far as the red blood cells are concerned no alterations of diagnostic or prognostic importance have been described. André and Lègér (1908) found poikilocytosis of a mild degree in some of their cases. When we turn to the question of the condition of the white blood cells, however, we find the most contrary views on what would appear to be, at first sight, a very simple problem. Bourret (1908) for example, while admitting that there is nothing characteristic in the white blood cell-picture in leprosy, records eosinophilia as a very frequent finding in his experience—especially in "neural" cases. It does not appear that adequate steps were taken to exclude the possibility of coincident helminthic infections in his cases, and it is further noted that many of the cases were complicated by malaria. Support to Bourret's contention regarding the frequency of eosinophilia is accorded by Gaucher and Bensaude, Darier, and Jeanselme, while Cabral de Leima and Morcira are equally emphatic on the opposite side. The last named worker found mononucleosis in 23 out of 25 "tuberculous" and "mixed" cases. de Marval (1928) reports that the polymorphonuclear neutrophils and the lymphocytes are normal, that the monocytes show a slight increase, that there is an eosinophilia, both relative and absolute—helminths were excluded—and that the blood platelets are normal.

It is probable that examinations of the white blood cells in leprosy have suffered from at least three very considerable defects: (a) Failure to select a series of cases sufficiently large and sufficiently representative of the various types, stages and phases of the disease. Any one can rapidly convince himself that the white blood cell picture in at least one type of case, viz., Muir's "B" type in the phase of acute reaction, is very far from normal. The present author (Henderson, 1927) has shown that the severe reactions caused in this type of case by the administration of potassium iodide induce a polymorphonuclear leucocytosis which may pass the 20,000 per c.mm. mark. (b) Failure to exclude the possibility of coincident diseases which may of themselves, alter the leucocyte picture. (c) Failure to realize the very considerable errors inherent in counting a given number of white cells in the ordinary "push" or "pull" film.

It does not appear unreasonable to insist that if this question is re-investigated, attention be paid to these points. Furthermore it seems to us desirable that in tackling this problem we should avail ourselves of the newer knowledge of the intimate morphology and of the origin of the various types of white blood cells made available by the studies of Maximow, Evans, Sabin and her co-workers and other cytologists, particularly in America.

(2) *Serological changes.*—(a) Variations in the plasma and serum proteins. The majority of workers are in agreement that in advanced nodular cases of leprosy—particularly during the phase of reaction—there occurs an upset of the normal relative and absolute values of the serum proteins, particularly in the direction of an increase in the globulin content, and that in early non-reacting cases no such departure from normal can be detected.

Schöbl and Basaca (1924) find positive globulin-precipitation in leprosy "in all forms" due to an upset balance between salts and globulin "possibly euglobulin." Frazier and Wu (1925) report excess of serum globulin in 17 out of 32 cases of leprosy "of degrees varying from one to three plus"—most marked in nodular cases.

Wade (1925) in his studies in the Philippines finds that the globulin value of the serum increases progressively with the course of the disease, tailing off in recovering cases, and further notes very high values in the phase of reaction and parallelism between formol coagulation and globulin value. It may not be out of place to mention at this point that Napier (1927), the originator of the formol-gel (or leuco-gel) test for kala-azar, denies the occurrence of true positive results in uncomplicated cases of leprosy. Such "positive" results have been reported in leprosy but these are almost certainly due to a failure to apply the standards of "positivity" laid down by the originator of the test.

(b) *The presence of specific antibodies to M. lepræ.*—Refinements in the methods of serological investigation have led to numerous ingenious attempts to devise a "test" which shall be "specific" for leprosy. The literature on this subject is extensive and I do not propose to do more than discuss very briefly the more important features of this subject. A list of references to original sources will be found in the appropriate section of the bibliography.

*Complement deviation tests.*—Babes (1909) considered that all active cases of leprosy show positive deviation of complement when extracts of highly positive leprosy tissues are used as antigen. His findings have been confirmed by Biehler and Eliasberg (1910), Clegg, McCoy and Hollmann (1913), Cooke (1919) and others. Thomsen and Bjarnhjedinnson (1910), however, in a carefully controlled series of experiments are definitely of opinion that there is no fixation of complement between leprosy tissue extracts and leprosy sera. Spindler (1912) concludes that the complement titre of leprosy sera is frequently within normal limits. Complement deviation in leprosy sera, using extracts of non-leprosy material as antigen, has also been recorded by various workers—Babes and Brusila (1909), Möllers (1913), Nejako and Asakura (1915), Lewis and Aronson (1923), Taylor and Malone (1924), Muir (unpublished observations) and others.

*Flocculation and agglutination tests.*—In this type of test also numerous (and not infrequently discordant) observations have been recorded. The papers of Slatinéanu and Danielpoulo (1908), Gaucher and Abrami (1909), Babes (1909), and among recent workers those of Muchow and Levy (1924), Rubino (1926), Gomes (1927), Marchoux and Caro (1928) and Gomes and Junior (1928) are of interest in this connection.

The avidity with which a "specific test" for leprosy has been sought is intimately associated with the increasing importance of the rôle played by the laboratory in the diagnosis of disease. The utility of any "laboratory" test or "reaction" is judged by the degree to which it is truly specific and to an almost equal extent by the aid it affords the clinician in the diagnosis or treatment of the disease in question. All the so-called "specific tests" for leprosy fail in one or other or both of these particulars. The complement fixation tests giving positive results not only with *M. lepræ* but also with numerous other acid-fast bacteria—both pathogenic and non-pathogenic—appear to be of the nature of group reactions. The most serious objection, however, to the hitherto described specific tests is that all of them give consistently positive results in the type of case in which clinically the diagnosis is only too obvious, while in the clinically doubtful and bacteriologically negative case they give negative or anomalous results.

(c) *Variations in the physico-chemical constitution of the blood.*—The most important physico-chemical change in the blood in leprosy is the acceleration of the sedimentation time of the red corpuscles which occurs in certain stages and phases of this disease. Observations bearing on this point have been recorded by Puxeddu (1924), Gilbert, Tzanck and Cabanis (1926), Landeiro (1926), Iturbide (1927), Labernadie and André (1927), Molinelli (1928), and Muir (1928) among others. Although there are undoubted individual exceptions, the acceleration in the time of sedimentation of the red blood corpuscles corresponds in a very general way with the extent of involvement of the tissues by the disease

process. Muir in particular has made extensive studies of this phenomenon, and he relies on the sedimentation time not only as an adjuvant to clinical and bacteriological diagnosis but as an efficient guide to treatment.

The present author is of opinion that the sedimentation time in any given uncomplicated case of leprosy is an indication not so much of the extent of leprosy invasion but of the extent to which the cells (particularly the so-called "lepra" cells) of constituent lesions are breaking down. In this view, acceleration of sedimentation time is proportional not so much to cell numbers as to cell instability.\* Muir holds the view that some physico-chemical change in the blood plasma precedes acceleration of sedimentation time.

The present author (Henderson, 1929) has recently emphasised the necessity for constant temperatures in making sedimentation estimations, and has correlated certain abnormalities in the sedimentation time with variations in the iso-electric point of the serum.

Henderson, De and Ghosh (1929) investigated the specific gravity of the blood, the surface tension of the serum and the fragility of the red blood cells in leprosy without finding any differences significant beyond the limits of experimental error.

(d) *The Wassermann and other serological reactions in leprosy.*—If one studies the literature relative to the Wassermann reaction in leprosy one notices a gradual change in the attitude of investigators with the passage of time, a change contemporaneous with increased knowledge of leprosy on the one hand and with increased perfection of serological technique on the other.

Babes and Busila (1909) were of opinion that the majority of sera from cases of leprosy give a positive Wassermann reaction with syphilitic antigen, and the findings of these workers were "confirmed" by Meier (1910), Photinos and Michaelides (1912), Sutherland and Mitra (1915), Ariazzi and Pico (1920) and others. As a result, the statement to the effect that "the Wassermann reaction is very frequently positive in leprosy, even in the absence of syphilis" became a commonplace in the literature dealing with the former disease.

The papers of later workers form rather a contrast to those mentioned above. Rogers and Muir (1925) basing their findings on the investigations of Lloyd, Muir and Mitra (1923) conclude that there are probably two factors producing a positive Wassermann reaction in leprosy; one is concomitant syphilis and the other is the breaking down of leprosy granulation tissue, which is more commonly seen in advanced "skin" cases.† In these latter, antisyphilitic treatment often fails to make the Wassermann reaction negative. Pineda and Roxas-Pineda (1926a) report on the examination of 500 leprosy sera by Kolmer's modification of the Wassermann technique. They conclude that the Wassermann reaction is negative in uncomplicated cases of leprosy in the ordinary non-reacting phase, and that when it is positive, complication by syphilis or yaws is indicated. It appears, however, that even these workers are not satisfied that the onset of the phase of leprosy reaction may not induce a positive Wassermann even in the absence of syphilis.

*The Kahn precipitation test.*—The findings obtained by those who have used the Kahn precipitation test in leprosy are on the whole more in agreement than the Wassermann results.

Yagle and Kolmer (1923) state that the Kahn precipitation test is negative in leprosy sera unless complicated by syphilis, and this finding has been confirmed by Pineda and Roxas-Pineda (1926b). The latter workers also note that the test is negative in uncomplicated cases of leprosy, even during the phase of reaction, and that it is therefore preferable to the Wassermann in detecting treponematosus infection. Arguelles (1926), working in the same area as Pineda and Roxas-Pineda, and with presumably similar clinical material, found the Kahn precipitation test positive in 5 per cent. of leprosy

\* Probably, however, both factors play a part.

† Later work has, however, tended to modify this view.

and suspect lepers without history or signs of syphilis or yaws. In "confirmed leper sera" the result was positive in 6.17 per cent. of apparently uncomplicated cases of leprosy. Otero (1927) states that the Kahn test is sometimes positive in uncomplicated cases of leprosy during the phase of reaction, while Greval (1928) denies that this test is more reliable than the Wassermann in excluding syphilis in cases of leprosy.

The Kahn precipitation test is used as a routine in the Leprosy Research Laboratory and Out-patient Department at the School of Tropical Medicine and Hygiene, Calcutta, and also in numerous leprosy treatment centres and out-patient clinics throughout India. Our findings in Calcutta at least, are in substantial agreement with those of Pineda and Roxas-Pineda.

**Other Serological Reactions.**—None of these has been given a sufficient trial in leprosy and it is difficult to assess their real value.

Ariazzi and Pico, in the paper already quoted, found the Sachs-Georgi flocculation test positive in 19 out of 65 cases (? uncomplicated) of leprosy while Leao (1923) recorded positive findings with the same test in 62.5 per cent. "macular," 39.2 per cent. "tuberculous" and 17.7 per cent. "nervous" cases. Sechi (1925) and Sakurai (1926) found anomalous results on investigating the Wassermann and Sachs-Georgi reactions in leprosy sera, while Pais (1927) recorded 18 per cent. positive Sachs-Georgi in uncomplicated leprosy. Vilanova and Catusas (1927) found very high positive figures with Vernes' reaction in leprosy sera, while Girard and Robic (1928) are of opinion that the Meinicke opacity test is frequently positive in syphilis-free lepers.

Modern opinion is tending gradually towards the view that a positive Wassermann reaction does not occur in uncomplicated cases of leprosy, provided the latest refinements in technique are used. The Kahn precipitation test would appear to be as reliable as the Wassermann reaction, and in view of its greater simplicity it is preferable to the latter in small hospitals and treatment centres.

(3) *Changes in the non-protein constituents of the blood.*—The progress that has been made in recent years in methods of chemical examination of the blood has led to investigations along this line in connection with leprosy.

The cholesterol content of the blood has been investigated by Boulay and L  ger (1923), Balbi (1925), Gomes, Leitao and Wancolle (1927), and Boyd and Roy (1928); non-protein nitrogen, uric acid, sugar and chlorides by Paras (1926), and by Otero and Hernandez (1928); calcium by Underhill, Honeij and Bogert (1920), Concepcion and Salcedo (1926), Lemann, Liles and Johansen (1927), Villela (1928), Cruz, Lara and Paras (1928), and the alkali reserve of the plasma by Paras (1927). There appears to be no change in the blood or serum content of any of these constituents which can be regarded as in any sense typical of leprosy.

(4) *The presence of *M. leprae* in the circulating blood.*—*M. leprae* have been noted in the circulating blood of lepers, usually advanced skin cases, particularly during the phase of reaction. The organisms may be free in the blood plasma or may be detected inside leucocytes, usually (it is said) mononuclears. Hollmann (quoted by Muir) in an analysis of the literature notes that of 44 investigators only 13 failed to find *M. leprae* in the circulating blood, and that Crow found this organism in the blood of no fewer than 21 out of 24 cases examined.

Honeij (1915) had 9 successes in 28 examinations. Iyengar (1919) reports 4 positive findings out of 10 "nodular" cases examined, 1 positive in 20 "anaesthetic" cases, and 2 positives in 10 "mixed" cases.

#### *Leprous lesions of the respiratory system.*

(1) *Larynx and trachea.*—The common sites of leprosy infiltration of the larynx are the epiglottis, the false vocal cords and the arytenoid cartilages. Huskiness of the voice is a common clinical manifestation and the subsequent organization of the leprosy granulation tissue may lead to laryngeal stenosis of a degree sufficiently

severe to call for tracheotomy. Many of the most severe cases are complicated by coincident syphilis. In the trachea no characteristic changes have been described.

(2) *Lungs.*—Hansen and Looft doubted the existence of true leprosy of the lungs. Later workers have, however, described and figured what appear to be undoubted lesions of the lung caused by *M. leprae*. Lesions of all degrees of severity have been recorded. As Babes and Moscu, Uhlenhuth and Westphal and others have shown, the lungs may appear to be normal on naked eye examination and yet *M. leprae* may be demonstrable on microscopic examination. At the other end of the scale there may occur peribronchitis, caseous softening and even gangrenous bronchial cavities.

While there does not appear to be any reasonable doubt regarding the occurrence of true leprosy lesions of the lungs, a much commoner finding in the experience of the majority of investigators is the onset of pulmonary tuberculosis as a complication in advanced cases of leprosy.

*Leprous lesions of the gastro-intestinal tract.*—Sugai (1921) describes the occurrence of superficial nodules on the tongue and tonsil with *M. leprae* in the salivary glands in some of his cases. Typical leprosy lesions of other portions of the gastro-intestinal tract have not been described. Fajardo (1924), however, claims to have found *M. leprae* in the faeces in 100 per cent. of severe nodular cases, in 80 per cent. of cases with fewer nodules and in 25 per cent. of nervous cases.

*Leprous lesions of liver, pancreas and spleen.*—The presence of leprosy lesions in the liver has been recognized since the days of the earliest workers. Hansen and Looft described the occurrence of round cell and bacillary infiltration along the portal vessels and in Glisson's capsule. Incidentally Hansen's figures clearly show *M. leprae* in what we now know as K  pffer's stellate cells, which he himself called the "endothelial cells of blood vessels." Organisms were also present in the white blood corpuscles within the hepatic blood vessels, but there were none in the liver cells themselves. Jadassohn however in Kolle and Wassermann's *Handbuch* quotes Doutrelepon and Wolters, Uhlenhuth and Westphal and others to the effect that *M. leprae* are occasionally found inside liver cells. Sabrazes (1925) reports massive involvement of the liver (and spleen) in an advanced case without *M. leprae* in the bile. Accumulations of "reticulo-endothelial cells" loaded with organisms were found in both organs. Rogers and Muir conclude that "leprosy bacilli are rare in (spleen and) liver" while Wade and Rodriguez note that the liver may contain *M. leprae* without being grossly disturbed either in function or in structure. In advanced nodular cases there is frequently evidence of amyloid degeneration in the liver; involvement of the lymphatic glands in the hilum of the organ is common.

Babes, Sch  ffler, Uhlenhuth and Westphal have found occasional *M. leprae* in the stroma of the pancreas, but lesions of his organ are extremely rare.

Pure leprosy lesions of the spleen occur not infrequently. Cellular proliferation occurs around the vessels and along the trabeculae; there is an apparent increase in numbers of the stellate cells of the reticulum and "globi" are sometimes seen. The lymphatic glands in the hilum of the spleen, like those in an analogous situation in the liver, are frequently involved and amyloid degeneration is found in advanced cases.

*Lesions of the circulatory system.*—No changes characteristic of leprosy have been described in the heart or large blood vessels.

*Lesions of the urinary system.*—In the experience of the majority of workers the kidneys seldom show definite leprosy lesions. De Buermann and Gougerot (1914) however describe acute and chronic leprosy nephritis and also bacill  mia of leprosy origin without signs of renal lesions. Rake (1888) found *M. leprae* in the kidneys in 49 examinations; Lagane (1912) and Honeij (1915) also report the occurrence of *M. leprae* in the urine. As in other organs amyloid degeneration is common in the terminal stages of advanced cases. No characteristic changes have been found in the urinary bladder.



*Lesions of the reproductive system.*—Infiltration and destruction of the testes is very common in advanced nodular cases and such patients are not infrequently sterile. Hansen and Looft described *M. lepra* both in and between the seminiferous tubules and also in the endothelium of the small vessels of the testes. In their experience the seminal vesicles are seldom involved.

Sugai (1911) notes the presence of organisms in the seminiferous tubules and in the duct of the epididymis, but very rarely in the ejaculatory ducts or in the seminal vesicles. Amyloid degeneration of the small vessels of the testes is commonly found. Wade and Rodriguez and Kobayashi (1924) have described the occurrence of *M. lepra* in the seminal fluid. The latter worker proposes examination of the testicular puncture fluid as a method of diagnosis in early cases. During the phase of reaction in advanced cases a very painful acute orchitis may occur.

The ovaries may be involved in leprosy—but not so frequently as the testes. Cellular infiltrations containing *M. lepra* and not infrequently visible to the naked eye have been described by Arning, Babes, and Glück among others.

The mammary glands may be invaded by tuberculous leprosy; and Babes has occasionally seen *M. lepra* in the gland cells. Powell (1924) has recorded hypertrophy of one or both nipples in 290 out of 385 male lepers examined and also in 3 of 7 female children below the age of puberty.

Pineda (1928) found *M. lepra* in 53 per cent. of 107 placentas examined at Cullion and in 24 per cent. of umbilical cords from the same group of cases.

*Lesions of the endocrine glands.*—Babes and also Lie have described the occurrence of *M. lepra* in the suprarenals. Beyond this nothing is known regarding the changes occurring in the ductless glands incidental to leprosy.

*The "leprous reaction."*—The leprous reaction or "lepra fever" is a phenomenon familiar to all leprologists and its clinical manifestations and treatment have been described by many workers. During this phase of leprosy there occur signs and symptoms referable both to a general systemic disturbance and to the exacerbation of local lesions. Chief among the former are fever, of a continued or irregularly remittent type, acceleration in the sedimentation time of the erythrocytes, increase in the globulin content of the serum, and in marked cases a very definite polymorphonuclear leucocytosis. The local manifestations, depending as they do on exacerbation of pre-existing lesions, are very protean. Hence we have one case characterized mainly by intense erythema and, it may be, breaking down of skin lesions; a second by intense neuritis with possibly abscess formation in the trunk of a nerve; a third by grave iridocyclitis and so on. While an exact correlation cannot, naturally, be established, there is in a general way a rough correspondence between liability to reaction and the degree of infection in a given case. Muir in particular is emphatic that any factor tending to lower temporarily the general resistance predisposes to the occurrence of the phase of reaction; chief among these factors are: (i) the commonly used "anti-leprotic" drugs, particularly potassium iodide; (ii) the incidence of acute or chronic infectious diseases; (iii) irregularities in diet or semi-starvation.

The intimate nature of the leprous reaction is not yet known. Briefly there are two theories; (a) that it is due to the simultaneous break-down of large foci of leprous granulation tissue with consequent release of a large amount of leprotic "toxin," (b) that it is a protein hypersensitization phenomenon. These views are largely complementary. Lowe (1929) has recently suggested a third possibility, viz., that the reaction is a toxemia, the toxin being the result of the union of an antigen (*lepra bacillus*) with the immune body or amoceptor produced by the defensive mechanism of the tissues. Study of the mode of action of the so-called "reaction-producing drugs" and especially potassium iodide has tended to incline the present author to the view that the onset of

the phase of leprous reaction can be explained in part at least on purely physico-chemical grounds. It seems to him that potassium iodide owes its remarkable reaction-producing power to the fact that it is a highly ionisable salt. Partial support is lent to this view by the fact that combinations of iodine with highly complex molecules, for example protein molecules, are almost entirely devoid of reaction-producing activities.

In a severe case of the nodular type, vast numbers of the so-called "lepra" cells are a prominent feature of the lesions. Many of these cells are crammed full of *M. lepra* and their protoplasm has undergone fatty degeneration; at the surface of the cell membrane there must be (theoretically at least) considerable instability of equilibrium. The sudden appearance in the tissue fluids of a highly dissociated substance may therefore lead to a still further diminution of cell surface stability, to the occurrence of widespread cytolysis and the onset of the reactionary phase.

The scope of the present paper does not permit a description of the varied histological pictures presented by leprous lesions during the phase of reaction—these it is hoped to incorporate in a future paper—nor of a discussion of the effects (harmful or otherwise) of a reaction on the course of the disease as a whole. A list of the more important papers will be found in the appropriate section of the bibliography.

#### SUMMARY.

An attempt has been made to collate under one heading certain observations on the bacteriology and pathology of leprosy which would seem to be important for the further study of the disease. That there exist large gaps in our knowledge even of the very fundamentals of the subject cannot be gainsaid. For this there are several reasons: (i) the markedly chronic and non-fatal nature of the disease; (ii) the very natural reluctance on the part of research workers as a whole to bend their energies towards the elucidation of the problems of a disease which has been regarded in all times with horror and loathing; (iii) the two prime failings of medical research (a) the isolated observation, (b) failure to correlate pathological with clinical findings. Both have been responsible for the most diverse statements regarding the findings "in leprosy" which ensue as the result of particular examinations.

It is hoped that this epitome with its accompanying bibliography may prove of assistance to other workers in the field of leprosy research in suggesting further lines of approach to the manifold problems of this disease.

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especially the new academic Diploma instituted this year by the University of London. This course is planned in a broad, practical spirit, and gives promise of a great advance on anything which has hitherto been systematically attempted with regard to public health teaching. Two large centres of public health administration have been secured as demonstration areas, an advisory committee of experts of the first standing in the Public Health Service appointed, and a scheme of special lectures arranged to be given by men and women eminent in their subjects; the course also provides for visits to works, factories, slum areas, garden cities, schools, and other institutions.

The courses of study in tropical medicine and hygiene are maintained at a high level, and include a special short course in hygiene for business or professional men and women proceeding to the tropics.

The University Grants Committee have intimated that the Treasury has sanctioned a recurrent grant-in-aid at the rate of £40,000 a year, but impress upon the School the necessity for taking all possible steps to secure an increased private income from the Colonies, from public or private subscriptions, and in other ways.

The Prince of Wales in his speech at the Opening Ceremony said that, if the work of this School were properly conceived and carried out, there should follow a steady decrease in preventable diseases, suffering, and death, and that by its work in this connection the School would be judged. The Board state that they have every reason to believe that Dr. Andrew Balfour and his colleagues in this post-graduate School will be well content that their work shall be judged by the standard which His Royal Highness has laid down, and will maintain that high tradition in teaching and research which their contemporaries would expect.

#### AN HONOUR FOR BENGAL.

AN Honorary Life Fellowship of the Ross Institute has been bestowed on Dr. Rai G. C. Chatterjee Bahadur of Bengal. During the past fifty years malaria has been spreading in many districts of Bengal. It has caused great misery, sickness, and loss of life. Within living memory hundreds of villages have been decimated by the disease; thousands of acres of once prosperous and highly cultivated land have been abandoned, or are cultivated by temporary labourers who do not dare make a home on the land; populous towns have been reduced to the status of miserable fever stricken villages; and the jungle is creeping in to blot out all traces of man.

All interested in the welfare of Bengal and its people have viewed the outbreak with grave concern. Government, assisted by both Europeans and Indians, have considered how best the disease could be stayed, and have adopted such means as appeared most helpful. But to Dr. Rai G. C. Chatterjee Bahadur in 1908 came the idea of rallying his disheartened and stricken fellow countrymen to apply the teachings of Sir Ronald Ross to their own salvation, through an Anti-Malarial League. In 1913 work was commenced in one village with volunteer labour. Its success attracted other villages to the movement. With the help of the distinguished Bengalee gentlemen, Dr. Bentley, and others, a Central Co-operative Anti-Malarial Society was formed in 1919 to assist in the formation of Local Co-operative Societies. To-day a network of some 2,000 villages throughout Bengal are making a great and successful effort to control malarial and other diseases.

This achievement, the first of its kind in Asia, has been largely due to the great but unassuming personality and splendid self-sacrifice of Gopal C. Chatterjee, and the Ross Institute desires to recognize his work by bestowing on him an Honorary Life Fellowship.

#### SIXTH INTERNATIONAL MEDICAL CONGRESS OF LABOUR ACCIDENTS AND PROFESSIONAL ILLNESSES.

August 1931, Geneva.

AFTER agreement between "The permanent International Commission for study of Labour Medicine" and "The permanent International Commission for

## Medical News.

### LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE.

(UNIVERSITY OF LONDON.)

At the Annual Meeting of the Court of Governors of the London School of Hygiene and Tropical Medicine held on November 27th, 1929, in the Lecture Theatre of the new School Building in Gower Street, the Board of Management of the School, whose Chairman is Lord Melchett, presented their Fifth Annual Report. Sir Holburt Waring was in the Chair. The lecture theatre is probably the finest of its kind in London.

In the year under review, ended 31st July, 1929, the new home of the School, its equipment, and the development of its organization advanced steadily towards completion. On 18th July the Prince of Wales formally opened the new building, which His Royal Highness described as a notable addition to the homes of learning in London.

Special reference is made in the report to the new course of study designed to prepare candidates for the examination for the Diplomas in Public Health, and



Professional Illnesses" it has been decided that the Sixth International Medical Congress of Labour Accidents and Professional Illnesses will be held in Geneva in August 1931.

The following questions will be studied:—

(1) *Slow results and evolution of the traumatic wounds of the spine.*

(2) *Traumatism of blood-vessels (arteritis and thrombophlebitis).*

(3) *Cutaneous infections in relation with Labour Accidents.*

(4) *Previous state by consequences of Labour Accidents.*

Further there will be a certain number of free questions, the subject of which shall be left to their authors' option.

*Participation:*—Every doctor whom these questions interest can partake at this congress.

*Information:*—For information apply to the General Secretary, Dr. Yersin, rue du Rhône, 1. Genève.

#### ANNOUNCEMENT OF THE SEVENTH POST-GRADUATE COURSE IN OPHTHALMOLOGY. VIENNA, 1930.

The seventh special course for post-graduate study in ophthalmology will be given between 1st October and 5th December, 1930, under the auspices of the American Medical Association of Vienna at the I and II Eye Clinic of the Allgemeines Krankenhaus, Vienna, Austria.

This intensive post-graduate instruction was first originated in Vienna in 1922 as a result of a suggestion by Dr. Edward Jackson of Denver to Prof. F. Fuchs. Prof. E. Fuchs is kind enough to participate in the programme. Prof. I. Meller and Prof. K. Lindner, chiefs of the Eye Clinics, have again consented to take an active part. The other lectures will be given by Prof. Lauber and A. Fuchs, the Docents Bachstetz, Guist and Pillat, and Assistants Dr. Safar, Dr. Urbanek, Dr. Fischer and Dr. Subal. Professors, Docents and Assistants of other departments will deliver lectures in their respective subjects: Prof. Kolmer on comparative ophthalmology; Prof. Schüller on Röntgen-rays, Prof. Hirsch on the Hypophysis and Sinuses; Docent Kofler on the modified West-operation; Docent Fuhs on Radium-treatment; Assistant Pollitzer on Embryology.

The course has been so arranged that the field can be covered systematically and comprehensively in the allotted time. A preliminary knowledge of ophthalmology is pre-supposed.

Concerning operations, only lectures with demonstrations will be given. In refraction, only advanced work will be given. In ophthalmoscopy, the non-electric ophthalmoscope will be used.

The entire course is given in English for a minimum of ten, and a maximum of sixteen men. The fee is \$250 per man. Applications with a certified check for \$50 should be sent to Prof. A. Fuchs, Vienna, VIII, Skodagasse 13. Applications are accepted in order of priority.

Further information can be secured by writing to Prof. Dr. A. Fuchs, Vienna, VIII, Skodagasse 13 or to the American Medical Association, Vienna, VIII, Alserstrasse 9, Café Edison.

## Current Topics.

### A Useful Hint for Intravenous Injections.

(Abstracted from *The Medical Press*, September 25th, 1929, p. 248.)

The present age of medical practice has adopted wholeheartedly the practice of intravenous injections of blood, saline, glucose, or other material. These injections have often to be repeated, and it not infrequently happens that considerable difficulty is experienced in finding a suitable vein after the first or second injection has

been given. For obvious reasons it is preferable to use the same vein repeatedly; it is less disturbing to the patient at the time, and in cases where the vein has first to be exposed it involves less discomfort afterwards. But there are practical objections to this course after an exposure of the vein has been made, for the finish of the procedure is usually a skin suture intended permanently to close the incision if not to obliterate the vein. Dr. C. L. Larkin, of Waterbury, in Connecticut, published in the August number of *Surgery, Gynecology and Obstetrics* a short note describing the procedure which he has adopted when performing an intravenous injection in bulk, and intending subsequently to repeat the injection through the same vein. It seems to us worth quoting for the benefit of our readers. Having exposed the vein he ties it off with a plain catgut suture at the lower end of the wound, then grips the vein just above the suture with a fine pointed forceps, and cuts with a scissors a small V-shaped flap above the suture, the apex of the flap pointing towards the suture. The fine forceps remain in position on this flap, and retracts it upwards while the injection is running in. When the injection has been completed the flap is allowed to fall back into position, the forceps removed, and the skin edges approximated by means of a black silk suture tied in a bow knot. This suture passes through the skin and superficial fascia opposite the base of the flap, and then under the vein, to come out directly opposite on the other side of the wound. Dr. Larkin finds that by this method the same vein may be used again and again, simply by untying the knot and picking up the flap.

### Fatal Laryngeal Obstruction by a Fish.

(Abstracted from *International Medical Digest*, Vol. XV, July, 1929, No. 1, p. 63.)

In a letter to the *British Medical Journal*, Dr. N. A. Dyce Sharp writes from Nigeria reporting a fatal case of laryngeal obstruction by a fish. He states that: "A few days ago a native woman was catching fish in the river with a basket net, and while transferring the small fry from the net she put one between her lips, her hands being full. The fish apparently gave a jump, and a moment later the woman was seen to fall, struggling to get her breath. Her friends at once opened her mouth and endeavoured to remove the obstruction; they failed, and after five minutes all her convulsive movements ceased. The body was at once brought to the mortuary, with a request for a necropsy; only afterwards did I discover that this was designed to determine whether she was a witch herself or whether she was bewitched, and here I failed! On removing the larynx and as much of the pharynx as possible, I found a small fish, 3½ inches long, wedged firmly down the trachea with the snout lying transversely between the vocal cords. Minute spines on the dorsal surface and at the border of the gills effectually prevented its extraction upwards, and indeed, the tail had already been pulled off by the victim's friends. As the width of its head was about 23 mm. and the breadth about 17 mm., the larynx was most completely and exactly occluded. This is well shown in the preserved specimen, which was fixed in an alcoholic solution of perchloride of mercury. A smaller or a larger fish could not have caused so complete an obstruction."

### Rationale of Digitalis Therapy in Pneumonia.

By R. C. TREIMAN.

(Abstracted from *International Medical Digest*, Vol. XV, No. 2, August 1929, p. 75.)

BECAUSE of its pre-eminence as a drug in heart failure, it is only natural that digitalis should have come into use for supporting the circulation in pneumonia. There is at present, however, an almost universal lack of agreement as to its usefulness.

In the less severe cases of lobar pneumonia the changes in the heart and circulation are no greater than in any



febrile process. In the more severe and fatal cases clinical examination may reveal alarming changes in the general picture—the pulse, blood pressure and heart. Breathing, difficult throughout the disease, may become shallow, rapid and inefficient. Cyanosis in some degree is almost constantly present. It has already been mentioned that complete irregularity with auricular fibrillation or flutter occurs in a significant number of cases. Some form of heart-block is not infrequent. In overwhelming infection the blood pressure often begins to fall early, the diastolic more proportionately than the systolic. On the other hand, desperately ill patients may have a fairly high systolic and diastolic pressure up to the period immediately preceding exitus. Dilatation is indicated by an increase in cardiac dulness; the heart sounds become less distinct and the apex beat more diffuse. The long diastolic pause is greatly shortened and the sounds, approaching each other in quality and timing, assume a foetal character. When death is near, the heart sounds become still fainter, the pulse more rapid and weaker, and all the signs of a vasomotor collapse may be present; ashy cyanosis, cold hands and feet, clammy perspiration and a sudden drop in blood pressure. The end may come with tragic suddenness, often within three or four days of the initial rigor.

When there is much clinical evidence of circulatory failure in severe or terminal pneumonia, it is necessary to remember that tachycardia, dyspnoea, cyanosis and, indeed, dilatation of the heart may occur without cardiac or circulatory incompetence. Before deciding to give any cardiac drug, one should analyze the various factors underlying each symptom and inquire what, if anything, one could hope to accomplish by changing the state of the circulation.

Tachycardia is a normal reaction of the heart to fever and toxæmia. In pneumonia there is an added factor of increased functional demand on the heart owing to anoxæmia. The decrease in lung area available for aëration of the blood with, perhaps, an atonic state of the peripheral vessels resulting from toxic action on the vasomotor centre, conspires to call forth tachycardia as one method of increasing circulatory rate. To slow the heart under such circumstances might be to remove from the forces of defence of the body a compensatory mechanism designed to meet the demands of the tissues.

It might still appear desirable to increase the period of rest of the cardiac muscle, since any increase in rate is at the expense of the diastolic or rest-period, normally about 13 out of 24 hours. However, the rate in pneumonia is usually not so high, nor is tachycardia present for so long a period that this *per se* should be an important consideration. Another reason for slowing the heart might be to maintain cardiac output, as it is generally believed that tachycardia tends to reduce the period of diastolic filling as well as the systolic output of the individual beats.

In the ordinary case of pneumonia, it would therefore appear unnecessary and perhaps meddlesome to attempt therapy directed at the tachycardia itself. When auricular fibrillation or flutter develops during the course of pneumonia, the administration of digitalis should be attended by the same brilliant results that are obtained in fibrillation occurring under any other circumstances.

It is necessary to distinguish the dyspnoea and cyanosis in pneumonia from that in cardiac disease. The fundamental fault responsible for cardiac dyspnoea is obviously to be found, not in the nature of the blood, but in the rate at which it is pumped; in the heart itself; and the same may be said for the cause of the cyanosis in cardiac disease. In pneumonia, on the other hand, there is not only a change in the blood, but there are also several factors quite independent of circulatory failure combining to produce dyspnoea and cyanosis.

Animal experiments have shown that the heart muscle in pneumonia is essentially normal and that an impaired myocardium is an infrequent cause of death in this disease. However, Brooks and Carroll, and Stone found degenerative changes, but these were no doubt due largely to a toxic action, and it may be assumed that the changes

are present to a lesser degree in the usual (less toxic) cases.

In lieu of direct methods of measuring myocardial function, changes in the heart size may furnish some evidence of the functional condition of the heart muscle.

The factors involved in the production of dilatation must be carefully considered. Probably those hearts whose muscles are already weakened or damaged by a severe toxæmia are more susceptible to other influences tending to produce dilatation. Starling and his pupils have shown that when the work presented to the heart is suddenly increased, the outflow of blood fails for a time to equal the inflow. The heart therefore gradually dilates until a new balance with equal intake and output of blood, but with an increased heart volume, is attained.

From this it appears that dilatation must be an adaptive phenomenon, increasing a temporarily decreased volume output. Such a dilatation might be termed "physiological" and is probably the type that usually occurs in pneumonia. However, when dilatation is not accompanied by increased systolic discharge, there is the so-called "pathological dilatation" which occurs when the myocardium is so damaged or atonic that increased length of the muscle fibre exceeds a critical value and can no longer be compensatory. This latter type probably occurs in a heart severely damaged by toxæmia, or with very extensive pulmonary consolidation.

That respiratory paralysis is the essential factor in fatal pneumonia is the belief of Newburgh, Means and Porter. That death in pneumonia can at least in part be attributed to vasomotor collapse is the contention of many others. The falling diastolic pressure, the moist skin, the gray-ashy cyanosis and the rapid pulse, so often seen in severe and fatal cases, lend support to this view.

The former belief that digitalis has no effect on the febrile heart has been thoroughly disproved.

Its possible toxic action also must not be overlooked. Digitalis is practically useless unless the dosage is sufficient materially to impair conduction. This impaired conduction is itself capable of causing toxic effects. While there is a fairly wide margin between the therapeutic and the fatal dose, the therapeutic representing about a third of the fatal, the experiments of Hirschfelder suggest that in febrile conditions therapeutic effects are obtained with relatively small amounts and that doses ordinarily considered therapeutic may cause toxic symptoms.

Irregularities of the heart produced by digitalis occur not infrequently. The most common early effect is vagus stimulation (sinus irregularity). The rate may fall to fifty or even less, so that syncope may occur between the contractions.

Digitalis may have a tendency to produce partial heart-block; it may occur with relatively small doses and may be permanent. It is possible, also, that digitalis may bring on auricular fibrillation where it is used in anticipation of fibrillation.

No slowing of the heart should be expected in pneumonia except where fibrillation intervenes.

While a rise of blood pressure through digitalis is often seen in animals, no rise occurs in man in either health or disease; indeed, even a decrease in diastolic pressure in cases with normal rhythm has been observed. The blood pressure in the usual case of pneumonia does not materially change. In the severe and fatal cases, however, where the blood pressure often does fall markedly, it is very doubtful whether digitalis can be of any value since the drop is probably due either to myocardial damage by toxæmia or to vasomotor paralysis.

Conservative observers are of the belief that the only indications for digitalis are two, viz., tachycardia due to auricular fibrillation, and decompensation. There are some investigators who assume that the effects on the myocardium produced by digitalis in the decompensated heart can be utilized in strengthening the heart in pneumonia. Such effects are supposed to involve the cardiac properties "tone" and "contractility."

It is to be deprecated, however, that all too often results obtained in experiments dealing with one or more of these so-called "heart properties" are unqualifiedly assumed, *a priori*, to show that the heart could be strengthened, sustained, stimulated, its volume output increased, etc., if the heart's "properties" could be augmented by digitalis. For it must be remembered that no one has ever shown what mechanism is responsible for the beneficial action of digitalis except in auricular fibrillation. Those who give digitalis in pneumonia to increase minute volume output not only must bear this in mind, but also they must not lose sight of the fact that it is even questionable whether digitalis actually can increase cardiac output.

The use of digitalis to increase cardiac output in the pneumonic heart is on a very uncertain basis.

Dilatation within physiological limits is an adaptive phenomenon in the usual case of pneumonia, making the heart a more efficient pump. In the severe cases, where the damaged heart tends to enlarge beyond these limits, digitalis, while enabling the fibres to draw on their reserve force by raising the strength of their contraction, does not raise the limit strength, and, as Hirschfelder points out, when that limit is already approached, digitalis may spur the fibres too far and drive them to overstrain and death.

Those who give digitalis as a routine measure must also realize that they are adding a potential poison of uncertain strength to a system already intoxicated. Finally, the routine use of digitalis is to be deprecated on the general principle that a drug is not to be prescribed until some special indication for it appears.

### Notes on the Treatment of Diabetes in General Practice.

By D. C. HARE, C.B.E., M.D., M.R.C.P.

(*The Practitioner*, September, 1929, Vol. CXXIII, No. 3, p. 202.)

THE discovery of improved methods of diagnosis and treatment has brought diabetes into the category of chronic diseases which should be faced optimistically by doctor and patient, for though the diabetic regime is a hard one, yet, speaking generally, it is not incompatible with a life of mental and physical vigour. The first condition of success is to obtain the patient's confidence and intelligent co-operation, for he will have to regulate his habits according to rule for the rest of his days. The treatment of diabetes may relieve symptoms completely without improving the pancreatic function or permitting of any relaxation of the regime; the natural instinct is to believe that "feeling well" is the same thing as "being well," which for the average person means abandoning all precautions. This in the diabetic leads rapidly to complete relapse.

#### METABOLIC BALANCE IN THE DIABETIC.

The diabetic never has a perfectly balanced metabolism, no matter how carefully the treatment may be regulated. In practice a condition of balance is approached when the urine remains free from sugar on a fixed diet (with insulin if necessary), which is sufficient to satisfy the normal appetite and to maintain a normal body-weight. The study of such a case by chemical tests of the blood shows, however, that the blood-sugar is more variable than in the normal, and is frequently above the normal concentration. The more severe the case the wider are the variations.

It has been taught that the ideal condition in the diabetic is that in which the sugar concentration never exceeds the normal maximum; this can be achieved by keeping the glycogen stores empty, and in a severe case only in this way, a condition in which the depleted patient suffers from languor and depression. Physical and mental vigour, which are the accompaniment of well-fed tissues, cannot be experienced when the patient is required to live for his energy supplies from hand to mouth, or from one meal to the next, with no reserves to draw from in the interval. Reserves are accumulated slowly as soon as the patient is given a diet with slight excess

over the daily requirements; at first, while the reserve is still below normal, blood-sugar remains low and glycosuria is absent for the whole twenty-four hours, and the patient appears to be in a condition of metabolic balance, but as the reserves accumulate and a more normal state of nutrition is approached, glycogen becomes available for mobilization when tissue energy is required, and this leads again to high blood-sugars and intermittent glycosuria. A break in the diet is suspected or a deterioration in the pancreatic condition, though neither is, in fact, the cause, and the patient is at this stage feeling much better than in his earlier under-nourished condition. The desire of the patient is not merely to be kept alive, but to carry on an active life, and the aim of treatment must be to secure a contented energetic patient rather than one whose blood-sugar may be found normal at all times and whose urine is above reproach.

#### DIET TREATMENT.

The treatment of acute diabetes in pre-insulin days was inevitably that of permanent under-nutrition preceded by fasting, often prolonged for two to three days, till the urine was sugar-free, when a "ladder diet" followed under the scheme introduced by Allen. This treatment should no longer be employed for the severe case already under normal weight, as it only prolongs the period of invalidity. A normal nutrition or "maintenance diet" should be given from the first, i.e., a diet calculated to maintain the normal body-weight in health; when at rest a low diet only is required, say ten calories to the pound of body-weight, and as activity increases the allowance must be raised gradually. The proportions of the three food constituents, carbohydrate, protein and fat are calculated and given in sufficient amount to produce the total calorific value required; the values may be obtained from published tables—those by Harrison and Lawrence are convenient for general use. After a few days, if glycosuria is still present, insulin is given.

The detailed regulation of diet will not be described here, there are many good books on the subject. The need for variety should not be forgotten, it is inhumane to condemn the patient to eat the same food daily. It should be remembered that the nutritional values vary widely, first in the food as bought, secondly, as cooked, and thirdly, as absorbed in the stomach and intestines. After the initial stages of treatment the patient should be given a list of foods forbidden and foods allowed and be taught to choose a varied diet of approximately correct values; this can be checked occasionally by obtaining a record of the actual menus for a week with the weight of food taken.

#### THE WEEKLY WEIGHT RECORD.

This is an important means of studying progress and the results of treatment, patients who are above or below the desired weight should lose or gain accordingly, and diet and insulin are adjusted to this end.

#### TESTING THE URINE.

Tests for sugar and acetone should be made daily when treatment is being begun, when any change of treatment is being introduced and when infection or other illness occurs. When treatment is established the sugar test should be made weekly on a mixed sample of urine, if possible on a complete twenty-four hours collection. All intelligent patients should be taught to do the sugar test and to use the results to regulate their diet and insulin dose within prescribed limits; they can thus detect if anything is going wrong and lapse from diet rules will bring a reminder and a check.

#### INSULIN TREATMENT.

The supply of insulin given hypodermically twice or thrice daily cannot replace the normal mechanism of secretion by the regulation of the blood supply to the gland. Insulin by injection is supplied to deal with absorption of alimentary carbohydrate taken in at a known time, but when the tissue sugar rises as the result of the mobilization of the glycogen reserves, insufficient insulin may be available to metabolize it and an excessive

rise and temporary glycosuria cannot be avoided. At another time, heavy exercise following a large dose of insulin may produce a temporary hypoglycæmia which does not occur with moderate activity. Experience has shown, however, that in practice the adjustment of the dosage is not difficult in adult cases. The easiest way of initiating the treatment is to begin with a moderate dose and increase it rapidly or slowly according to the needs of the case while keeping the diet constant; when the patient's "balance" is being worked out, changes in both diet and insulin dose should not be made simultaneously. In the averagely severe case insulin may be begun with a dose of 10 units twice daily, increasing every forty-eight hours by 10 units daily till a dose of 50 units daily is given. This is an average maximum dose, and although the diet may not be quite balanced it will be well to pause before making a further advance; a reduction in the carbohydrate allowance may be necessary to secure the required result. Doses of 25 units at a time should seldom be exceeded, and a large evening dose should be avoided.

The reaction to insulin can be watched with some accuracy by means of urine tests while glycosuria is still present. The effect in lowering the blood-sugar and the sugar output begins about a quarter to half an hour after the dose and reaches a maximum from two to four hours after. If the dose is not enough to lower the blood-sugar below the "renal threshold for sugar," i.e., the concentration at which sugar passes out of the blood into the urine, the urine secreted will contain sugar and the dose can safely and with advantage be increased. To carry out the test, separate urine specimens are collected; the bladder should be emptied about a quarter of an hour after the injection (this specimen will probably contain sugar) and at two-hourly intervals. The specimens at two and four hours after the injection and meal are those which will probably be sugar-free, the time of return of urine sugar can be noted and another insulin dose introduced or the amount of the dose increased. When glycosuria is only occasional or apparently absent, a total twenty-four hour collection should be made and tested, and if sugar is found, the time at which the "leak" occurs can be traced by the examination of separate specimens; but, as explained above, it is usually impossible to keep the blood-sugar of the well-nourished severe diabetic continuously normal with two or even three doses of insulin daily, and urine-sugar leaks occasionally occur and do not call necessarily for change in treatment.

Hypoglycæmia of slight degree occurs frequently in the course of treatment and need cause no anxiety. For evidence of slight attacks the patient's own account of his symptoms must be relied upon; and those who have been warned are sometimes over-anxious and relate suggestive symptoms due to other causes. Giddiness, "an all-gone feeling," "eyes coming over dark," sweating and trembling, when noted from two to four hours after insulin may be attributed to low blood-sugar concentration. It is particularly likely to develop after unusually heavy muscular exertion. The treatment is to lessen the insulin or increase the food or add a small amount of food at the time when symptoms are likely to develop. Patients on large doses should be taught to cut down the dose before undertaking heavy work. Severe hypoglycæmia need not be feared in an adult on an ordinary dose that has been gradually reached; it has occurred after the massive doses that are given in the treatment of diabetic coma. Fits and severe symptoms are produced sometimes in young children of three or four years on moderate doses, and may be difficult to avoid, as the blood-sugar levels vary widely under constant conditions from day to day, but with careful watching no harm results.

#### INSULIN AND CARBOHYDRATE BALANCE.

There is no constant insulin-carbohydrate ratio which can be applied to the treatment of diabetes; the amount of carbohydrate which a unit of exogenous insulin will metabolize varies with the internal pancreatic and hepatic activity of the individual and the rate of absorption of

the carbohydrate. When taken in a non-concentrated form in which absorption is slow, as in green vegetables and fruits, the diabetic metabolism aided by exogenous insulin can deal with carbohydrate more efficiently than when the same calculated value is given in concentration, as in starches or sugars; in consequence, diet restrictions remain a fundamental part of the treatment and the carbohydrate is restricted both in total value and in the form in which it is taken. A high total diet with large insulin dosage in a severe case lead to excessive gain of weight due to deposits of fat; and in some cases to a condition resembling oedema; a loss of balance and a return of glycosuria follow. Young patients are particularly liable to this condition, which must be treated by a period of under-nutrition and reduction of insulin. Severe diabetics fattened under the influence of insulin may develop a fatal ketosis should they acquire a septic infection; it seems as though once their large stores of fat begin to break down into ketones no further treatment with insulin and carbohydrate will arrest the process.

#### ADMINISTRATION OF INSULIN.

Every patient who is not physically incapable should be required to give his own hypodermic injections. Dependence on a doctor, nurse or relative may lead to forced intermission of treatment at a critical time. Local reactions and infections are extremely rare in spite of imperfect technique. No preparation for oral administration has been found hitherto to replace the hypodermic administration.

#### BLOOD-SUGAR ESTIMATIONS IN DIAGNOSIS AND TREATMENT.

The blood-sugar concentration varies from hour to hour in relation to the taking of food, especially of carbohydrate, and also with exercise; this range of variation is far wider in the diabetic than in the normal, and must be kept clearly in mind. When sending patients for a test to the laboratory the clinician must know what particular point he wishes investigated; haphazard estimations on a patient who is taking a haphazard diet and passing an unknown amount of sugar will give little information which cannot be obtained in other ways.

Tests made under controlled conditions are valuable in certain cases:—(1) For diagnosis; (2) for an estimation of the severity of the disease; (3) for guidance in treatment in respect of diet or insulin; (4) for estimating progress; (5) in ketosis. Fasting tests are usually made, unless for special reasons, and the preliminary fast may be from four hours to twelve hours (overnight), or for a longer period.

(1) *Tests Required for Diagnosis* are not necessary in cases which present the symptoms of clinical diabetes. They should always be made in cases of pregnancy with glycosuria and in cases of doubtful origin where the condition may be due to an endocrine disturbance of thyroid or pituitary or a "renal glycosuria." The fasting estimation in such cases is usually followed by a "sugar-curve," in which the patient is given carbohydrate by the mouth, and the rise and fall of the concentration in the blood is watched for the following two or three hours. "Sugar-curves" are seldom required in true diabetes, and are not advisable in a severe case.

(2) *Tests for Estimating the Severity of the Disease.*—In uncomplicated cases the test should be made after the patient has been under treatment by diet for a week or fortnight and is on a known carbohydrate intake and output as estimated in a daily urine collection. If glycosuria has been abolished by diet it may be discovered that the patient has a raised "renal threshold" for sugar, i.e., when the urine is sugar-free the blood-sugar is above the normal leak-point for sugar, 0.18 gm. per cent. The urine should always be obtained at the actual time of making the estimation to establish this point. The preliminary fast should, if possible, be an overnight fast, the longer periods of fasting, twenty-four or forty-eight hours, are not of value in ordinary

clinical work: the estimation is needed as a guide to the severity of the case and the treatment that will be required, and for that purpose should be made during a period of normal resting metabolism, and not during starvation.

(3) *Tests for Studying the Effect of a Single Dose of Insulin.*—These are sometimes required when the symptoms suggest hypoglycaemia.

(4) *Tests for Studying the General Course of the Disease.*—These may be made at intervals of a few months, but deterioration or improvement will usually be apparent in other ways.

(5) *In Ketosis.*—Tests are invaluable in cases with threatened or developed coma where massive doses of insulin must be given in quick succession. The treatment of coma is outside the scope of this paper.

## Reviews.

**CINCHONA IN THE EMPIRE, PROGRESS AND PROSPECTS OF ITS CULTIVATION.**—By J. M. Cowan, M.A., D.Sc., F.L.S. 1929. Pp. 9. Reprint from the "Empire Forestry Journal," Vol. 8. No. 1. 1929. Price, 6d.

EVERY medical man in India should read this small brochure, for it is a complete exposition of the present position of the cinchona problem, and of very great interest and importance. The author is Officiating Director of the Botanical Survey of India and Superintendent of Cinchona Cultivation, Bengal.

At present at least, quinine cannot be produced synthetically. Yet it is estimated that some 800 million persons are attacked every year in the tropics by malaria, and according to Sir Ronald Ross more than two million deaths occur annually from the disease. The economic loss due to the disease is put down by Dr. Andrew Balfour at between £52 and £62 millions a year.

Prior to 1880 the world's supply of quinine was obtained chiefly from the cinchona forests in Ecuador, Bolivia and Peru, but the plant was then introduced into India and Java, and the story of the adventures and hardships of the early pioneers—Weddell, Hasskarl, Markham, Ledger, and others, is well known. In India the earliest plantations were in the hands of private planters in the Nilgiris, but, as the plant did not prove an economic success, these plantations were uprooted. To-day cinchona is grown in three areas in India, at Mungpoo in the Darjeeling district under the Bengal Government, in the Nilgiris under the Madras Government, and a small experimental station in Burma. The Dutch, however, have gone vastly ahead with a well organised and subsidised official organization; to-day Java supplies more than 50 per cent. of the world's requirements of quinine, and India but 4 per cent. India in fact, imports two-thirds of her annual consumption under present conditions.

Such a situation is naturally very unsatisfactory. Sir Patrick Hehir has estimated that the smallest amount of quinine which would have any influence on malaria in India is 970,000 lbs. a year, the present consumption being about one-sixth of this figure. The necessity for vastly increased production of cinchona, and for greatly reducing the present price of £1 9s. 6d. per lb., is therefore obvious. In India it is estimated that the number of deaths from malaria total approximately 1,300,000 a year.

From these preliminary observations, the author goes on to describe methods of cinchona cultivation, and the alkaloidal constituents of the bark. There are no less than sixty-five species of *Cinchona*, but *Cinchona ledgeriana* gives the largest quinine yield. Conditions for cinchona cultivation are peculiar; there must be evergreen forest on granitic or volcanic rock formation. The soil must be rich, porous, well-drained and with moderate to steep slopes. The least water-logging is fatal to the plants. The plant will not withstand either great heat or frost. The limits of rainfall are from 75 to

180 inches per annum; the altitude from 1,500 to 5,000 feet. Forest has to be felled and then burnt; and the seedlings have to be in a nursery for six months before being planted out. Two transplantations are necessary. Harvesting begins about the fourth year, but the richest yield is obtained when the trees are uprooted in the tenth year. The land has then to be allowed to revert to forest for some years before it can be planted again. It will be seen therefore that only certain selected areas in India and Burma are suitable for cinchona cultivation, and the only test as to whether a given area is or is not suitable is an experimental trial on a small plot. The problem of finding suitable land resolves itself into a process of elimination.

The second basic problem with regard to increasing India's yield of quinine is to enhance the output of cinchona per unit of area. This is a matter for scientific research work. Financially, there need be no fear that cinchona cultivation will not pay; "I think it is no exaggeration to state that so far as the material side of the question is concerned" wrote Grassi, "the benefit derived annually from the anti-malaria campaign is sevenfold the value of the money expended."

We trust that Dr. Cowan's little pamphlet will have a very wide circulation in India.

R. K.

**THE RAT, A WORLD MENACE.**—By A. Moore Hogarth, F.E.S. Pp. 112, with several illustrations. 1929. London: John, Bale, Sons & Danielsson. Price, 7s. 6d.

WE trust that this compact and most useful book will have a wide sale in India among medical men, public health officials, and even the lay public. The rat is the foe of civilization, but—above all—the foe to-day of India. The book is at once complete, extremely informative, useful for both reference and reading, and very interesting. It is dedicated to the Medical Officers of Health of Great Britain "whose courage and sagacity have saved the administration of an unsatisfactory Rats' Act from being utterly abortive." In an introduction to the book, Sir Thomas Horder, K.C.V.O., F.R.C.P., writes that the book is not merely a standard textbook on the subject, but that it is a model for others who seek to add to the literature on pestology.

Chapter I deals with the history of the rat, and of rat migrations within historical time. The different species of rats and mice are described, and an appendix gives the draft of a Rat Destruction Bill presented to the House of Commons (but not passed) in 1919. In Chapter II the habits of the rat, and its amazing fecundity are discussed; the section is full of detailed, and often novel, information. Rats commence to breed at 3½ to 4 months of age, and the ordinary litter recurs about four times a year and consists of about six or seven young. Four pairs should produce about 10,934,590 young in ten years, whilst the progeny of a single pair in ten years, under absolutely favourable circumstances, might amount to the appalling total of 48,319,698,843,030,344,720, which would leave no room upon the globe for any other form of life. Fortunately, as in all forms of life with extreme fecundity, the mortality is almost equal to the production of young.

In general, the rat population for any given area may be assumed to be about ten times the human population. In other words, the total consumption of foodstuffs by rats in Great Britain may be roughly put down at £100,000,000 per annum. Not only is this the case, but the damage to valuable libraries, pictures, tapestries, and other works of art is perhaps almost as important. The United States are said to spend \$1,825,000,000 yearly in feeding rats.

Turning to human diseases spread by rats, plague of course comes first and foremost, as we know too well in India. The connection of the rat with epidemic leptospiral jaundice is also well known (though here perhaps it is rather a case of both man and the rat becoming mutually infected from contaminated water supplies; yet there can be little doubt that the dead bodies of such rats may contaminate a water or food supply). Trichiniasis is a third example of a rat-borne disease,

rat-bite fever (a quite common disease in India) a fourth example. (It seems rather a pity in this connection that the author appears to have consulted no literature more recent than that of 1919; there has been much more recent work on the disease.) *Hymenolepis diminuta* infections are also rat-transmitted, and meliodiosis, a glanders-like disease, is also suspected of such transmission. On pp. 31 and 32 is given an imposing list of the natural ecto- and endo-parasites of rats, protozoal, helminthic, entomological and bacterial.

Of natural enemies of the rat, the cat comes first, but is usually too well fed and looked after to be of much use. The barn owl and kestrel are probably more useful. The author discusses the Rodier system; this suggests the universal trapping of rats; that all captured females should be destroyed, but all captured males again let loose. If by this means the natural excess of females over males were to be replaced by an excess of males over females, the rat population would destroy itself. The method is of great interest as a suggestion of a method of biological control, but, we fear, impracticable in practice.

Chapters on how to kill rats, flooding and smoking, ferreting, and trapping, follow. The last is of special value, and the value of almost every different type of trap is discussed, also when to use them and when not. Chapter X deals exhaustively with rat poisons. Very numerous prescriptions are given, and details on how to prepare and lay baits. Virus control is then discussed; this has been put forward chiefly of recent years by the researches of Jensen in Copenhagen. Most viruses at present in use are harmless to animals other than rats, whilst Raebiger in 1928 in Germany claims that 98.6 per cent. of village, town and farm plots had been freed from rats by the extensive use of virus. Details are quoted on p. 83 of the book.

Further chapters follow on the special measures necessary to deal with rats in different situations, in farms and outbuildings, in factories and warehouses, in sewers, and in ships. There is here much sound writing and useful, detailed, advice. Suggested measures—largely of legislative type—are discussed, and a final chapter on deratisation concludes the book, and includes several quotations from the daily press. The volume is not indexed.

*The Rat, a World Menace* is a book which should make a very special appeal to medical men in India. At present our measures against the rat in India are but half hearted, whilst the killing of even such a pest as the rat is discouraged by religious prejudice. Education, above all, is necessary, and in this volume the public health propaganda worker, the special plague officer, and the general medical worker in India will find much of both interest and importance. It is well written, commendably brief, and well published. We hope that it will be appreciated by a wide circle of readers in this country.

R. K.

**THE WRITING OF MEDICAL PAPERS.**—By Maud H. Mellish-Wilson, Editor of the Mayo Clinic Publications. Third edition, revised. Pp. 184. 1929. W. B. Saunders Co., Philadelphia and London: Price, 7s. 6d.

Doctors may excel in their own profession, but, almost without exception, they are very bad authors. An article submitted to a medical journal for publication should be brief, well written, succinct, and ready for press with but a few slight alterations. Yet, in the case of this journal at least, the majority of papers received and published have not merely to be corrected, but re-modelled and re-written. We can wish ourselves no better fate than that every one of our regular contributors should buy a copy of this small and most useful little book, and study it. Apart even from the question of style, there are certain usages in scientific publications, such as the methods of constructing a bibliography, which the medical profession badly needs to learn. "The artist uses whatever material and whatever forces he

finds at hand, but he does not allow himself to be mastered by them. And when he has finished his work, he does not fall down before it. He looks at it critically, he sees its limitations, and he plans a new work which he hopes may surpass it," quotes the author from Crothers.

The subject matter of the book is arranged in two parts, the first seven chapters being devoted to technical details, and the last thirteen to general instructions. Good usage, vocabulary, the use (and misuse) of italics, the use of abbreviations, the construction of tables, punctuation, grammatical notes, and a splendid chapter on "don'ts" comprise the first part. Then come chapters on arrangement, the preliminary drafted outline of the paper, construction, case histories, references, revision, title, and volume of output.

The last named subject is all-important. Mr. Clifford Dobell, F.R.S., once told the reviewer in conversation that his criterion of the value of a medical paper was whether it would be either read or consulted a hundred years hence. Judged by such a standard, nine-tenths of present-day medical literature might well be sieved out, and the grain separated from the chaff. To quote the author of this book "many of the journals now in existence are a discredit to the profession, and there is also the deplorable fact that their doubtfully valuable contents must be included in our already overcrowded indexes." To publish twelve papers a year should constitute professional malpraxis, and there are authors who write far too much and far too frequently.

The succeeding chapters deal with the manuscript, the proof, quoted material, and the index. A most valuable list of the standard abbreviations for medical journals occupies 48 pages, and a good index completes the volume.

Everywhere the instructions are clear, well expressed, and admirable. Each chapter commences with an apt quotation, and ends with *obiter dicta*. This valuable little book has gone through three editions in seven years. We can express our appreciation of it best by hoping that it will see many more editions, and that it will make a special appeal to our contributors. Surely it is not too much to ask of the author who sits down to write a paper for publication that he should make a preliminary study of style and good usage.

One of our chief difficulties in India, which the author has not encountered in America, is the "capitalist." The Indian typist cannot keep away from capitals; for example if the paper deals with malaria, this word is always written Malaria. A second special difficulty in India is the abbreviationist; he will invariably write pt. for patient, m.p. for malaria parasite—whereas it might just as well stand for military policeman; and T. B. for tuberculosis.) If we can remember to do so, we promise to send the author of this book a typical script, as received by us, after correction. She might decide to incorporate a page of it in her next edition as an example of "how not to do it"!

R. K.

**THE AMERICAN ILLUSTRATED MEDICAL DICTIONARY.**—By W. A. Newman Dorland, A.M., M.D., F.A.C.S. Fifth edition (1929), revised and enlarged. Pp. 1427. Profusely illustrated. Philadelphia and London: W. B. Saunders Co. Price, thumb Indexed 37/6; plain 35/-.

We have reviewed previous editions of this invaluable work. It is not a "dictionary," but an encyclopædia; in brief it is almost the medical *Encyclopædia Britannica* for the physician and medical author and editor. It is admirably printed, profusely illustrated, extremely well bound with a limp morocco binding.

In its present edition this most valuable work has received the most thorough revision of its long career, dating from 1901. A large corps of associate workers has combed the literature of the two years since its last new edition in 1927, with the result that several thousand new terms have been added. Careful revision has been given to the wording of every definition in the work. The terms in anatomy, pathology, physiology and physical therapy have received special attention. A



definite standard has been adopted in terminology, spelling, hyphenization, etc.

The entire book has been re-edited by the editorial staff of the American Medical Association, whilst Dr. E. C. L. Miller, Professor of Bacteriology and Biochemistry in the Medical College of Virginia, has collaborated with the author in the revision. The new edition has been reset from new type, and many illustrations added. That it is very fully up-to-date is obvious from a perusal of its pages.

The standard spelling adopted is, of course, American, rather than British. Under *factus*, for instance, we are referred to *fetus*; under *Entamaba*—synonym, *horribile dictu*, *Entameba*—to the still worse *Endameba*. These violations of etymology are inherent in the American language; and the English reader can only be grateful that the older and more correct forms are still given for reference. It would be easy, but unprofitable, to try to pick holes in what is a splendid and invaluable work of reference.

The arrangement is excellent, and the illustrations—especially the full page colour plates—are very good. We are sorry that opposite p. 953 the colour plate of the malaria parasites still shows these important organisms in their unstained condition; surely such a method of examination is now never practised in the tropics; and a new plate showing the appearance of the parasites in Romanowsky stained films is wanted. *Plasmodium kryptoplastikon* is new to us; it is Schiller's supposed protozoal protozoan parasite of cancer (and might well be left to disappear into obscurity).

These very minor criticisms do not in any way detract from the sterling value of this monumental work. A copy of the new edition should be in every medical library in India. A specially valuable feature of the work is that pronunciations are given throughout, and also Greek derivations: this adds very greatly to the value of the work.

R. K.

**REPORT OF THE SEVENTH CONGRESS OF THE FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE.** British India. Dec. 5th–10th–24th, 1927. Calcutta, Government of India Press, 1929.

THE full *Transactions* of this Congress are in course of publication, and Vols. I and II of these *Transactions* have already appeared, and have been reviewed in our columns.

The present small volume, however, is different. It is a summary of information connected with the Congress, and most useful for reference, and to gain a general idea of the Congress. No price is mentioned, but we presume that the volume is obtainable from the official agents for government publications.

The book opens with a list of officers of the Congress and Council; then follows a brief and useful resumé of the proceedings of the Congress, with abstracts of papers and discussions. The opening addresses are given verbatim, and the agenda and minutes of the official business meetings. An account of the different tours made by foreign delegates in India comes next; then the report of the committee on heriberi, Philippine Islands. A complete list of members of the Association occupies some sixty pages; and will be found most useful for reference. The volume closes with the articles and by-laws of the Association.

We have dealt in such detail with this Congress that we need not further dilate upon the present volume. It will be found generally useful, both for reference, and as a resumé of the Congress.

**BRONCHIAL ASTHMA—ITS DIAGNOSIS AND TREATMENT.**—By H. L. Alexander, A.B., M.D. London: Baillière, Tindall and Cox. 1929. Pp. VII plus 171 with 8 figures in the text. Price, 10s. 6d. net.

THE subject of asthma has been approached from so many viewpoints and such an enormous amount of literature has grown around it, that it is indeed difficult for an average medical man interested in the subject to form a clear idea of the main issues involved. The various

causative factors, be they infection, psychic disturbance, nasal irritation, allergy or mechanical irritation of the bronchi, have been stressed by various authors with so much warmth and emphasis that a broad conception of the subject—that it is something more than an effect resulting from a single process—is seldom fostered in the minds of the readers. "Bronchial Asthma," by H. L. Alexander, presents the problem of asthma in a crystallised and condensed form and hence may be expected to make a strong appeal to the minds of medical men. The handy size of the book (a monograph of about 160 pages) is another point in its favour. Without attempting to enter into minute details, the lines of treatment have been admirably indicated. The appendix at the end of the book lays down the common diagnostic methods, and the bibliography at the end of each chapter gives valuable references.

R. N. C.

**THE EYE IN GENERAL MEDICINE.**—By Dr. Paul and Ramsay, M.D., LL.D. Second Edition of *Diathetic and Ocular Diseases*. London: Baillière, Tindall and Cox. 1929. Pp. X plus 255. Price, 12s. 6d. net.

THIS is the second edition of the author's "Diathesis and Ocular Diseases," and has been entirely re-written and re-arranged and is now published under its present name. The book is not a systematic textbook of ophthalmology, but a personal record of the author's long clinical experience of morbid conditions of the eye in relationship to general disease. The contents consist of ten chapters which are complete in themselves on various diseases in which the eye plays an important part. The author points out how essential it is to bridge over the gap between specialism and general medicine. The principles of general physiology are sufficiently broad to include every organ of the body and it is the same physiological and pathological processes which are at work. The ophthalmologist must be first and foremost a doctor, familiar with general medical principles, and must realize that the cause of the disease is not necessarily to be found in the organ manifesting the symptoms, and no treatment can be successful until the cause underlying the disease has been discovered and removed. General medicine owes much to ophthalmology, and how often in one's clinical experience have signs of serious general disease been discovered by lesions in the eye such as diabetes, nephritis and cardio-vascular disease, and it is important that the general practitioner should have a knowledge and take an interest in the diseases of the eye.

The author is dogmatic in his teaching and presents his articles in a clear and convincing fashion and written in a simple style. The book makes very delightful reading and will prove of great interest not only to the ophthalmologist but to the general practitioner. We cordially recommend it to our readers.

E. O'G. K.

**SKIN: ITS USES IN SIX PHASES.**—By Lewis E. Hertslet. London: J. & A. Churchill. 1929. Pp. XVIII plus 206. Illustrated. Price, 10s. 6d. net.

THIS book has been written by an enthusiast obsessed with the value of light as a curative of all diseases. Unfortunately in the tropics we often suffer from the effects of too much light, and there is a well known Arab proverb that only Englishmen and fools prefer the sunlight to the cool shade.

In spite of the enthusiasm of the author, the book contains a mass of facts dealing with the skin from the different aspects. The work has been written from the popular point of view, and should appeal to those who are interested in this subject.

H. W. A.

**ON PRESCRIBING PHYSICAL TREATMENT.**—By Matthew B. Ray, D.S.O. M.D. (Edin.), London: William Heinemann (Medical Books) Ltd. 1929. Pp. IX plus 179. Illustrated. Price, 10s. 6d. net.

THE author states in his introduction that "This book is written entirely from the standpoint of the prescriber, and is not intended to be anything in the nature of a



technical handbook. There are many of the latter in existence which fill their purpose so well, that an addition to their number would be superfluous. Such works have been written by specialists in electro-therapy and kindred sciences, and are not intended for the busy practitioner, who has neither the time nor the inclination to sift out what is, to him, a vast amount of irrelevant information, in order to find the clear cut directions which he wishes to embody in his prescription."

With this point of view the reviewer is at variance, because of the danger involved to the patient by such a procedure. To relegate the practice of physical therapy to that of allopathy, and for a physician who is not specially qualified in the subject to prescribe in "clear cut directions" the treatment to be given to one of his patients by one qualified to do so, is as absurd as it would be for a physician to indicate to his surgeon the proper way to make the operation required. It is not at all to be commended.

However, in spite of this, the work is to be recommended, because within 179 pages the writer gives a valuable bird's-eye view of the subject, which is at least interesting reading for the spare time of a general practitioner. There are 6 plates and 7 illustrations in the text.

C. G. R. M.

**AIDS TO DERMATOLOGY AND VENEREAL DISEASES.**—By R. M. B. MacKenna, M.A., M.B., B.Ch. (Camb.), M.R.C.P. (Lond.), M.R.C.S. (Eng.). London: Baillière, Tindall & Cox, 1929. Pp. VIII plus 236. Figures in the text 7. Price, 3s. 6d. net.

THIS book is a very useful primer, and should be used as an introduction to the subject of dermatology. The book is well written and the lines of treatment are brief and to the point. In this country where dermatology is not taught in the medical schools, the practitioner would be well advised to get this book to study before advancing to the larger textbooks on this subject. We can confidently recommend it to our readers.

H. W. A.

**RADIUM AND ITS SURGICAL APPLICATION.**—By H. S. Souttar, D.M., M.Ch. (Oxon.), F.R.C.S. (Eng.). London: William Heinemann (Medical Books) Ltd. 1929. Pp. VII plus 60. Illustrated. Price, 7s. 6d. net.

THOUGH radium as a therapeutic agent has been known for many years there has been a lamentable lack of a clear exposition of its uses, and the results obtained. There is probably due to the fact that in many cases its use is still in the experimental stage, and few have been found with courage sufficient to publish their results. This volume, therefore, is very opportune, for here we have the subject dealt with in 60 pages in such a lucid manner that a medical practitioner will have not only no difficulty in following the author, but also will positively enjoy reading him.

The author first of all deals with the physics of radium: next the apparatus and means of application, then the sensitivity of the tissues to radium, and proceeds to deal with malignant growths in various situations, which are suitable for radium therapy.

The reviewer, from his own experience, can corroborate the views of the author, and would draw particular attention to the following cases cited by the author:

"A man of 53 had complained for three months of epigastric pain, increased by food, of loss of appetite, and of loss of weight which he estimated at 2 stones. On exploration a firm, smooth oedematous tumour of greyish colour was found involving the lesser curvature, and extending upwards almost to the cardiac orifice. It was regarded as a carcinoma of a rapidly growing type and it was obviously inoperable. There were, however, no enlarged glands." It was decided to treat the case with radium, and there follow details of the procedure adopted. The result was as follows:—

"The patient made a normal recovery, his pain ceased, his appetite returned, and in three months he had

regained his normal weight and was a picture of health. Nine months after the operation he has had no return of symptoms."

"A man of 72 had suffered from increasing difficulty in swallowing for three months and he could now only swallow sips of water with great difficulty. A tall, powerfully built man, he had lost 3 stones in weight and he was so weak that he could scarcely stand. An x-ray film showed that the œsophagus was obstructed by a malignant growth 10 inches from the teeth. On œsophagoscopy a large ulcerated mass of growth was seen encircling the œsophagus, bulging prominently inwards on the left side." There then follow details of the radium treatment adopted. The result was as follows: "In 24 hours there was a distinct improvement in swallowing, which may, however, have been due to the passage of a bougie at the operation. In a week he was taking ordinary soft foods, and was obviously gaining weight and strength. In 4 weeks he was taking an ordinary full diet, with the sole precaution that he should eat slowly. In 6 weeks he had gained nearly 2 stones in weight and appeared to be in perfect health."

As the author proceeds; "These are typical examples of our experience in a considerable number of cases, and although we are not so optimistic as to expect that recurrence will not take place, after following most of them for several months we feel that they are a considerable advance on any results we have previously seen."

Again the writer can corroborate from personal experience, and, if anything, the author has understated the claim of radium as a miracle worker in apparently hopeless cases.

This little book is thoroughly sound in all points, and has the merits of lucidity and brevity so rarely met with in dealing with so abstruse a subject as radium. It stands on its own merits and is to be recommended to all interested in their profession.

C. G. R. M.

**ESSENTIALS OF MEDICAL ELECTRICITY.**—By E. P. Cumberbatch, M.A., B.M. (Oxon.), D.M.R.E. (Camb.), M.R.C.P. Sixth Edition. Revised and Enlarged. London: Henry Kimpton. 1929. Pp. XVI plus 443 with 11 plates and 116 illustrations. Price, 10s. 6d. net.

THE sixth edition of this famous work is to be welcomed by all interested in the subject. The present volume is changed in size and format, with considerable improvement in both type and paper. Dr. Cumberbatch's name is well known as perhaps the greatest authority in medical electricity in England, and the present volume amply retains his high prestige, for not only does he deal with the matter theoretically and scientifically, but also practically, to the great benefit of both the student and the operator. In fact, it may be stated that anyone who has thoroughly mastered the contents of this book, has knowledge sufficient for the management of the majority of cases requiring electrical treatment. There are in all 18 chapters, each complete in itself, dealing with the various aspects of the subject. One particularly valuable chapter is the Index of Electrical Treatment (Chapter 18). This should certainly be read by all practising physicians and surgeons, for it reveals the scope of this form of therapy in lucid and brief words.

This work is recommended to all interested in the subject, as one of the clearest expositions of it known to the reviewer.

C. G. R. M.

**METHODS AND PROBLEMS OF MEDICAL EDUCATION (12TH SERIES).**—By R. M. Pearce, Director of Medical Sciences, The Rockefeller Foundation, New York, U.S.A. Pp. 466. Illustrated.

Any publication from this source well repays the time spent in its perusal. This volume is certainly up to the usual high standard.

One of the main difficulties in medical education is the difficulty of knowing how the problem one is concerned with, is being tackled in other countries. Perhaps there is no sphere of the subject more open to this than that of radiology, for it is seldom that anyone, with both

the experience and judgment necessary for such a task, can be granted more than a month's leave a year.

Consequently, this volume, which contains the personal report of 39 Chiefs of Radiological Departments, representing 11 different countries, is particularly valuable to anyone in control of either a teaching centre or an X-Ray Department. There never has been collected together, until now, between two covers, articles written by such famous names in radiology as A. E. Barclay, Guido Holzknecht, Preston M. Hickey, Robert Knox, J. Magnus Redding, and Friedrich Dessauer, etc. All of them make stimulating reading and it is difficult to single out articles for special consideration.

The considered exposition of the subject by Holzknecht should, however, be read by all practising the art of medicine in whatsoever sphere, for here there is a fearless declaration of both the scope and limitations of radiology. Another article that all interested should read, perhaps the best in the book, is that of A. E. Barclay on the Organization and Equipment of an X-Ray Department.

The illustrations are ample and very adequate for the difficult subject they portray, and show the diverse ways in which different people have approached the same subject. There is a good index, and the quality of the paper is good.

In conclusion, this is a work well worthy of the great institution which produced it, and great praise must be given to the editor and his staff for its production.

C. G. R. M.

**SNAKES OF AUSTRALIA.**—By J. R. Kinghorn, C.M.Z.S., with a Foreword by H. A. Longman, F.L.S. Australia: Angus and Robertson, Ltd. 1929. Pp. 198 with 137 drawings, photographs and text-figures. Price, 10s. net.

THIS book is a very useful guide for the recognition of the common poisonous snakes of Australia. The illustrations are very well done and in colours, which helps to make the recognition of these reptiles an easy matter. A key is given at the beginning of the section to identify the common genera and species. A book on similar lines illustrating the snakes of India is very much needed for the use of medical officers and other workers in the mofussil.

H. W. A.

## Annual Report.

**REPORT OF THE HAFKINE INSTITUTE, BOMBAY, FOR THE YEAR 1928. BY MAJOR, S. S. SOKHEY, I.M.S., OFFG. DIRECTOR. BOMBAY, GOVT. CENTRAL PRESS. PRICE, 6 PIES.**

The Haffkine Institute, with its admirable laboratories, large staff, and spacious grounds, is in a particularly favourable position for medical research work, and its annual report is always of interest. We cannot do better in reviewing it than to quote Major Sokhey's general review of the year, which is as follows:—

**Plague Vaccine.**—During the current year about two million doses of Haffkine's Plague Prophylactic were sent out; this is a considerable increase on the last year's demand. The United Provinces of Agra and Oudh and the Punjab are still the largest consumers.

The process of manufacture of the prophylactic has remained unaltered. But the discovery by Dr. Goré of the fact that blood agar is the medium of choice for the growth of *B. pestis* has enabled us to detect with greater certainty contaminating organisms in the prepared vaccine, and thus secure greater purity of the finished product. Dr. Goré has found that the growth of *B. pestis* is more profuse on blood agar than on nutrient agar. If dilutions of broth culture of *B. pestis* are made, a point is reached when the dilution planted on nutrient agar shows little or no growth, while blood agar shows numerous colonies. This dilution in the case of six weeks'

cultures of *B. pestis* in broth—Haffkine's Prophylactic—is roughly 1 in 1,000. A small quantity of culture to be tested is diluted as indicated above and is planted on blood agar and nutrient agar. If after 48 hours incubation the agar slope shows any growth at all, contamination is suspected and further exhaustive tests are made.

This test is now being used as a routine measure for testing the purity of the seed cultures and the fully incubated vaccine. Until this test was introduced, besides the sugar reaction, the purity was judged by the appearance of agar slopes planted with undiluted cultures. The slopes were incubated for 48 to 72 hours, and if they presented a ground glass semi-translucent appearance they were taken to indicate pure plague cultures; moreover in the sugar test *B. pestis* was expected to ferment without the production of gas, glucose and mannite only. We now know the ground glass appearance of the agar slopes does not necessarily indicate pure *B. pestis* growth. Some contaminants, especially a Gram-positive coccus, escape detection, because they in no way disturb the so-called ground glass appearance of the agar slopes. Those common contaminants produce no change in the sugars, and so again escape detection. All these organisms are easily detected by the present blood agar test. If any growth appears on agar slopes it raises a suspicion of contamination, and the examination of discrete colonies which are regularly obtained on blood agar decides the point.

Making use of Goré's blood agar slopes, Major Sokhey and Dr. La Frenais made a number of quantitative determinations bearing on the manufacture of Haffkine's prophylactic. They have found that a wide range of pH of the medium gives good growths of *B. pestis*—pH 6.2 to 7.4, with a slight advantage in favour of 7.0. In the broth ordinarily used for the preparation of the prophylactic the growth of *B. pestis* comes to an end at the termination of three weeks. The addition of  $\frac{1}{2}$  c.c. of rabbit blood per 10 c.c. of broth makes the growth much more profuse than that in broth without blood. It was also found that although the growth is profuse, it loses its virulence rapidly. After about 40 subcultures in blood broth, each of 48 days duration, 40 million organisms failed to kill rats, where the 50 organisms of the original growth in nutrient broth killed cent. per cent. of the rats.

Major Sokhey and Dr. La Frenais also investigated into the validity of the routine test in use for testing the immunising powers of the various brews of the prophylactic manufactured. The results of duplicate tests on the same brews varied sometimes by 300 per cent. and more, and showed that the test had no value as a measure of the immunising properties of the prophylactic. They found the test dose of 0.003 mg. of plague-spleen used in the routine test was a very variable quantity as far as the number of plague bacilli contained in it went. An actual count of seven test viruses made and used by Dr. Naidu in his work showed that the number of organisms in 0.003 mg. of his test virus spleen varied from 120 to 46,000. In place of the routine technique 23 experiments were performed with 11 brews, using a test virus containing organisms between 490 and 1,000. The results of duplicates were much closer together, but still the variation was great enough to render the test valueless. Work on the question is still proceeding. It is proposed to place this work before a committee of experts to recommend some minor changes in the manufacture of the plague prophylactic.

**Parasitology of Plague.**—The Plague Expert Committee of the Health Organisation of the League of Nations at their first session in Calcutta in December 1927 laid down the lines of future research in plague and they laid stress on the "Investigation into the comparative epidemiological rôle of the various species of fleas in plague transmission in selected areas of India." This investigation was taken up by Major Webster and Dr. Chitre in August, and the work is still proceeding. But it may be mentioned that up to now they have secured successful transmission experiments with all the three species of fleas found in Bombay, i.e., *Xenopsylla cheopis*, *X. astia*, and *X. brasiliensis*. The successful transmission

with *X. brasiliensis* is interesting as this species has not previously been proved to be a vector of plague in India.

**Anti-plague Serum.**—The work by Dr. Naidu and his assistants reported last year has been continued during the year. Following on the successful experiments in the production of a potent anti-plague serum in rabbits; calves and sheep have been selected as the experimental animals to obtain larger quantities of the serum. The work is proceeding, and the results obtained so far are promising.

**The Pharmacological Department.**—Work on the chemotherapy of plague has been continued. Two classes of drugs are claiming the attention of the department:—(1) the three dihydroxybenzenes—catechol, resorcinol, and quinol, and (2) mercurated phenols and mercurated amines. Forty-eight mercurial compounds have been synthesized and the department is now directing its attention to animal experiments. The work is not sufficiently advanced yet to record any results.

The indigenous drugs section has been studying *Garcinia mangostana*, *Terminalia* sp., and *Gymnema sylvestre*. These investigations are of scientific value; but those who expect the immediate discovery of wonderful therapeutic agents in large numbers to replace the remedies in use at present are sure to be disappointed. Investigations into the nature of indigenous drugs is a problem which involves much time and labour. It is a matter of regret that the pharmacological department is understaffed.

**The Biochemical Department.**—Researches in anæmia by Major Sokhey and his assistants have revealed the great prevalence of anæmia resembling pernicious anæmia among men and women in Bombay. Their studies show that anæmia of sprue and of pregnancy have a great resemblance to pernicious anæmia, and they believe that the so-called anæmia of pregnancy is not a distinct entity, but merely an aggravated condition of anæmia commonly present in non-pregnant women.

The work on basal metabolic rate was continued during the year and results tend to show that the average rate for India is about 10 per cent. lower than that for Europeans. This they are inclined to believe is due to climatic factors in the widest sense of the term.

The department is also establishing normal standards for various substances usually investigated in diagnostic medicine in the chemical analysis of blood and urine. The department was also engaged on some problems connected with the manufacture of plague vaccine as noted above. Besides the research work the department has proved of value in aiding the more advanced physicians in their diagnostic work. It is now practically impossible to practice modern medicine without the aid of biochemical analytical work.

**The Antirabic Department.**—The statistical figures for the department given in the body of the report show that the value of the antirabic centre is well understood by the public, and that full use is made of the centre. Against 718 persons who received treatment, 458 persons reported here who did not need any antirabic treatment. They were advised regarding keeping the offending animal under observation, and their wounds were dressed.

Thorough disinfection of the wounds was carried out as a routine measure in the treatment of all cases who reported for treatment within a reasonable time after injury. The death rate among patients so treated was 0.43 per cent. as compared with the death rate of 1.63 per cent. among patients not so treated for various reasons.

It is to be regretted that the majority of the out-centres which receive antirabic vaccine from this Institute have not furnished statistical returns for the treatments carried out by them. They should realize that antirabic treatment has not reached finality and that it is still in an experimental stage. Unless accurate records are kept of all the cases treated, and statistical returns supplied, efforts at the improvements in the treatment are hampered.

**Researches on Sprue.**—A comprehensive study of this disease, started by Col. Mackie and his colleagues in 1923 and resumed in 1925, was brought to a close this

year when Col. Mackie left the Institute to take up the appointment of Officiating Public Health Commissioner with the Government of India. The broad conclusions arrived at by these researches were summarised in the last report and most of the papers foreshadowed have either appeared during the year or are in press.

**Enquiry on Maternal Mortality in Childbirth.**—The investigation was continued throughout the year. Dr. Balfour was on leave from March to October, and her place was taken by Dr. Milne. In October the staff of this enquiry was strengthened by the employment of Dr. Lucy Wills. Dr. Milne and Dr. Mehta continued the routine examination of cases of anæmia of pregnancy and also carried out a series of animal experiments. *B. welchi* has been considered by some to be the possible etiological factor, but the animal experiments done here give no evidence to that effect. Nor do animal experiments with streptococcus give evidence that this organism is of any etiological significance.

Dr. Wills has studied 50 cases of anæmia of pregnancy, and four non-pregnant cases with a similar blood picture. She finds the blood counts and pictures of the two categories to be similar. Free hydrochloric acid was present in almost all cases, and they all responded to liver treatment equally well. Dr. Wills has reason to believe that the so-called anæmia of pregnancy is not a pathological entity. The macrocytic anæmia, evidently quite common among the women in Bombay, is made worse by the strain of pregnancy. Dr. Wills is also inclined to the view that this type of anæmia very likely is a deficiency disease, and she is taking up animal experiments to test this hypothesis.

**Tuberculosis Enquiry.**—At the end of August this enquiry, under the charge of Dr. Soparkar, was transferred from Kasauli to Bombay. Dr. Soparkar and his assistants have been engaged in an investigation of the nature of organisms causing the surgical type of tuberculosis in human beings. This type of disease is known to be caused by the bovine bacillus, but in India they have come across only one case out of a series of more than 65, which was due to the bovine bacillus.

Their preliminary experiments with B. C. G. have not borne out the claims made for its immunising power. They are also carrying on experiments upon transformation of tubercle bacilli of one type into another, but they have arrived at no conclusions yet.

**The Indian Research Fund Association.**—The cost of the plague, anæmia, maternal mortality and tuberculosis enquiries, amounting to Rs. 1,37,677, was borne by the Research Fund Association. In future years the situation as regards grants from the Association is likely to be altered radically. The Fletcher Committee which was referred to in the last year's report, has recommended the establishment of the Central Research Institute at Dehra Dun, and the Rockefeller Foundation has decided to build the Public Health Institute at Calcutta.

So the position is that Bombay is to receive no aid from any outside agency to help it to make provision for post graduate-training in tropical medicine or public health and hygiene. Bombay is as important a centre of medical education as any in India, but its promising graduates must continue to go elsewhere to complete their training in tropical medicine. Calcutta has a flourishing School of Tropical Medicine and will soon have a first class Institute of Public Health and Hygiene; while Bombay has neither. One School of Tropical Medicine is not enough for the whole of India, and it is high time for Bombay to make provision for itself.

It is a melancholy fact that Bombay is making no headway in providing for research work in medicine. So far all the research carried on at this Institute has been subsidised by the Research Fund Association, and had it not been for substantial help from that Association the Pharmacological and Biochemical Units of this Institute would possibly not yet be in existence. Should the Research Fund Association stop their contributions, most of the research work now in progress will have to be abandoned, with little hope of being resumed in the near future.

The atmosphere of co-operation and cordiality, so essential for scientific endeavour, was maintained without blemish by the staff. The acting director received unstinted and loyal support of his colleagues which made his work easy and profitable.

## Correspondence.

### RADIUM IN INDIA.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—It is a matter of great regret that no central agency exists in any large city in India, capable of carrying out radium treatment on modern lines and of supplying radium emanation to other localities. This state of affairs places the surgeon in a helpless position as regards the treatment of many inoperable malignant growths, such cases being handed over to the not very tender mercies of opium and other drugs.

The question is really one which should be taken up by the Government or a Central Committee as an extension of the British Empire Cancer Campaign, or as an independent movement. It is only in this way that adequate funds could be raised.

Australia provides an example of beneficent energy in this direction. The University of Sydney raised £7,000 for cancer research in 1921. The sum was found to be quite inadequate, and a further £134,000 was collected by a public appeal. With this money research was started in earnest. In 1927 the Government of the Commonwealth sanctioned £100,000 for the purchase of radium, and a Cancer Research Committee now exists and is able to produce a journal to publish its activities and stimulate research.

Surely something of the sort is possible in India where vast sums of money are expended by wealthy individuals in vicarious charities. Any large-hearted attempt to advertise the crucial importance of the early recognition of cancer would alone save many thousands of lives yearly. A small Radium Institute exists at Patna, greatly to the credit of the Government of Bihar and Orissa, but this is a mere speck in the ocean when one considers the size of India. In other places small amounts of radium exist, but are only available in a very restricted sense. Perhaps nothing short of three radium centres would be sufficient to cope with the great demand which would soon arise, but one efficient centre would first be needed to gather experience and give an idea of the probable cost of the larger undertaking.

In Calcutta the radium facilities are most lamentable for a great city. What little radium is available is doubtless utilized to the greatest advantage, but a much larger supply is needed, together with a supply of skilled workers for the distribution of radium emanation for the cure of suitable cases.

Recent advances in the technique of radium administration, especially the various methods of deep and intimate burying of radium-charged needles next to the growth by the help of surgery, have done much to revive confidence in this method of treatment. Some of the recently published results have been wonderful, but time alone will show whether the cure is always permanent.—Yours, etc.,

FRANK POWELL CONNOR.

CALCUTTA,  
9th December, 1929.

### PROLAPSUS UTERI.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I write with reference to Captain Variava's article on "Wertheim Schanta's interposition operation for complete prolapse of the uterus" and your note thereon in the December number of the Gazette.

Lest it be imagined that this is a new operation, I should like to point that it is thirty-one years old. I quote from Graves's *Gynaecology* (1923), page 229:—"The Watkins' interposition operation for prolapse and procidentia. The principle of the Watkins' operation

is based on separating the bladder from the anterior wall of the uterus and transposing its attachment to the posterior wall, so that the uterus is left in a position to support the entire bladder. Watkins performed his first operation in 1898. Several modifications, notably that of Wertheim, have appeared since."

Devoting six pages to the details and illustrations of the operation, he adds on page 836, "Wertheim described an operation in 1899 similar to that of Watkins and based on the same mechanical principles."

I frequently saw the operation performed when I was a student—over twenty years ago; it seemed to fall into disuse later and is now only barely—if at all—mentioned in English textbooks. American books, such as Kelly's or Graves's, describe it fully. In the latter there is a word of warning, "The interposition operation has numerous disadvantages, among which are the preclusion of further child-bearing, the persistence of bearing-down symptoms that often follow it, the frequency of bladder symptoms, and the difficulty of the situation if the operation turns out to be a failure."—Yours, etc.,

S. A. McSWINEY, M.B., F.R.C.S.I.,  
MAJOR, I.M.S.

BARISAL, E. B.,  
18th December, 1929.

### ANTI-PLAGUE VACCINE IN THE TREATMENT OF PLAGUE.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In the recent epidemic of plague at Raichur, almost all cases which I saw were of typical bubonic type, with typical symptoms, the bubo usually being in the femoral region. As the therapeutic value of intravenous injections of iodine in this disease has been recognized by previous workers, I used it as a routine measure, giving injections containing from  $\frac{1}{2}$  to  $1\frac{1}{2}$  grs. In spite of these injections most patients showed severe constitutional disturbances within 48 hours of commencing treatment, with delirium and restlessness. Severe asthenia would set in about the third day of treatment, and the prognosis was bad. In my experience intravenous iodine, whilst of value in cases seen on the first day of disease, is of little value when a state of severe toxæmia has occurred. The ordinary principles of treating toxæmia, such as surgical treatment of the primary focus of infection, saline infusions to dilute and eliminate the toxins, and specific antitoxic sera or vaccines are now indicated.

After arriving at this conclusion, I was called upon to treat an elderly Mahomedan male, over 50 years of age, of weak constitution. Headache and vomiting were present, with a femoral bubo, and toxic delirium set in within a few minutes of my seeing him. As I understand that the clear supernatant fluid which separates when Haffkine's anti-plague vaccine is allowed to settle contains immunising principles, I administered 2 c.c. of the vaccine diluted with 8 c.c. of normal saline intravenously. Within quarter of an hour there was high reactionary fever with rigor, but an hour later there was great relief of symptoms. Consciousness was regained, and the patient passed urine, which he had not done for several hours previously. I then gave an intravenous injection of iodine, and the patient made a dramatic recovery within 24 hours of first commencing treatment.

As this case occurred towards the end of the epidemic, I had no further opportunity of testing the method on other cases. I conclude however that the value of intravenous iodine is chiefly confined to cases seen within the first 24 hours of onset of the disease; that intravenous injections of anti-plague vaccine may be of value for cases seen at a later stage; whilst blood transfusion from donors who have recovered from plague, though a measure which suggests itself, is one which it is difficult to adopt during an epidemic.—Yours, etc.,

T. S. NAIDU, L.M. & S. (Hd.),  
Private Practitioner.

RAICHUR, HYDERABAD STATE,  
15th December, 1929.

## A TEST FOR CARBON TETRACHLORIDE.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—With reference to the "Notes on the use of Carbon Tetrachloride" by Dr. S. C. Nag in the December 1929 issue of your journal, the following may be recommended to test the chemical purity of any given sample of carbon tetrachloride.

Add a drop of metallic mercury to 10 c.c. of the given sample. If the sample is pure, there should be no change of colour. With an impure sample, on the other hand the mercury becomes black, owing to the formation of sulphide of mercury. Since the sulphur impurities seem to be responsible for the toxic effects, the above test is quite sufficient for all practical purposes.—Yours, etc.,

O. URCHS, M.D.,

HAVERO TRADING CO., LTD.,  
15, CLIVE STREET, CALCUTTA,  
14th December, 1929.

## THE STERILISATION OF HYPODERMIC SYRINGES.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—With reference to the correspondence in your columns on this subject, I am of opinion that the quickest and best method of sterilisation is to simply draw 90 per cent. spiritus rectificatus in and out of the syringe about half a dozen times. I do not carry tincture of iodine with me, but simply paint the part to be injected with spiritus rectificatus from the same phial. I have given thousands of hypodermic, intramuscular, and intravenous injections by this method during the past nine years' practice, and have never seen any sepsis result.

I may add, however, that when giving injections of neosalvarsan, sulfarsenol, diphtheria antiserum or other serum, I am always very particular to wash out all traces of spirit by drawing boiling water in and out of the syringe, as if any trace of alcohol is present, the fluid becomes milky or turbid.—Yours, etc.,

AWAT T. SHAHANI, M.B., B.S.

J. W. DISPENSARY,  
BURNS ROAD, KARACHI,  
18th December, 1929.

## THE PURITY OF TUBE WELL WATERS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I was very interested to see the article by my old friend and brother-officer Lieut.-Col. G. G. Jolly, who is now Director of Public Health in Burma, in your last issue. His article gives an interesting account of a very common occurrence in connection with deep wells. He observes that under certain climatic conditions there is a decided falling off in purity of the water drawn from the tube even though this penetrates the earth for a considerable depth. It is, of course, usually assumed that at a great depth in the earth's surface no bacteria can live, and, therefore, water drawn from this point should show no trace of surface pollution. The assumption is perfectly correct, the water should be sterile. In actual practice it frequently is not. The correct explanation of the occurrence is to be found in one very simple fact, viz., that there is nearly always a small leakage of contaminated subsoil water down the outside of the tube, which ultimately finds its way into the pure deep water around the end of the pipe. An extremely interesting account of this occurrence was reported by Dr. Andrew Balfour, some time in 1908. It was observed that water taken from a very great depth (as far as I remember about 800 feet) was habitually polluted, and also the same organisms that appeared in the supply could be found in the Nile itself. It was suggested that possibly there was some underground fault that communicated between these two sources. Other instances of this have been reported from time to time. In practically every case the same remedy produces a cure of the conditions. If the tube of the well is grouted around the outside with liquid cement forced in

with compressed air, the purity of the water is invariably restored. An explanation is extremely simple; the grouting forms an impervious collar round the tube and cuts off all surface water entirely, and, consequently, removes all chances of pollution. It is significant that in Lieut.-Col. Jolly's article there is a correlation between rainfall and the amount of contamination. This is exactly what one would expect. The nearer the surface the subsoil water is, the greater chance of its being polluted. A few drops of polluted surface water would account for the presence of bacteria at great depths. If Lieut.-Col. Jolly will consult a sympathetic engineer and arrange with him to dig away the earth from the tube for about 8 to 10 feet in the ground, then to grout the tube with liquid cement, hammering it well in with compressed air, he will find that all his troubles will disappear.—Yours, etc.,

W. W. CLEMESHA,  
LIEUT.-COL., I.M.S. (retd.).

MALARIA CONTROL SCHEME,  
DAYTONA, KANDY, CEYLON,  
13th December, 1929.

## LEECHES IN CARDIAC DISEASE.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—At one time venesection and the use of leeches were recognized as being of value for various ailments, and they are still recommended in cases of urgent symptoms of heart failure with engorgement of the right side of the heart and liver. Whilst abstraction of a small volume of blood (about 8 oz.) followed by the administration of cardiac tonics may not be of permanent value, yet it may alleviate the distressing symptoms for some days, and enable the patient to transact legal and important business. The following are particulars of such a case:—

I was called to see a young married woman, aged 25, who was in a state of acute cardiac dyspnoea. She was unable to speak, or to swallow any nutrition, and had to be propped up on pillows. There was a history of chronic rheumatism, and examination showed a severe condition of mitral regurgitation present. The cardiac dullness extended considerably over on the right side of the chest, whilst the liver was enlarged to three finger-breadths below the costal margin.

I gave an injection of digitalin at once, with gr. v. of calomel, and a stimulant mixture; 15 leeches were applied over the hepatic area.

Next morning the patient had passed a restful night and was much better. Again 15 leeches were applied. For six days the prognosis was almost hopeful, the patient slept well, took ample nourishment, and even—against orders—attempted to walk to the window. There was no dyspnoea, and the liver dullness had diminished. The relief however was only temporary, for on the eighth day the dyspnoea and other symptoms recurred with severity, and despite the further application of leeches and other measures, the patient died on the ninth day.

The abstraction of blood, however, gave an interval of a few days during which the patient was mentally and physically much relieved. A similar case is reported in Burney Yeo's *Manual of Medical Treatment*.—Yours, etc.,

VENILAL N. MODI, M.B., B.S.

RAOPURA, LIMDAPOLE,  
BARODA,  
3rd December, 1929.

## BLUNDERBUSS THERAPY.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—Is a medical man justified in employing Rheumatism Phylacogen, Sulfarsenol, and Plasmoquine injections in a typical case of typhoid fever?

A patient suffering from typical typhoid fever, until the end of the first week, was making satisfactory progress in the hands of a competent and well qualified medical practitioner, when a relative, without consulting the medical attendant, called in another doctor. The



second doctor refused to allow the first to have anything further to do with the case, refused to see him in consultation, and took the case out of his hands. The "remedies" administered were as above. Finally, I was called in, and found the patient almost in *extremis*; there was low muttering delirium, a quick thready pulse, hurried respiration, bleeding from the right ear, incontinence of urine and faeces, and a large and severe bed sore over the sacrum.

The Civil Surgeon was now called in and confirmed the diagnosis of typhoid fever, which was further confirmed by a strongly positive Widal reaction. Fortunately, the patient recovered with proper medical attendance and nursing.

There was never at any time in the case any suspicion of any disease other than typical typhoid fever, and no evidence of rheumatic fever, syphilis, general septic fever, or pernicious malaria. The case is of interest, however, from the unprofessional point of view.—Yours, etc.,

P. S. SARMA, M.D.

SITARAM MILLS, LTD.,  
PUSHPAGIRI, TRICHUR, S. INDIA,  
25th November, 1929.

### THE ALL-INDIA MEDICAL LICENTIATES' ASSOCIATION.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR.—May I crave the hospitality of your columns to draw attention to the Silchar Branch of the All-India Medical Licentiates' Association? The objects of the Association are to create unity with a view to enlisting sympathy for our cause, to review our present position, to devise ways and means for promoting professional progress, scientific knowledge, and welfare; in brief to advance the moral, material, social and intellectual progress of medical Licentiates in this Province, whether they are in government, district or local board, railway, tea garden, or State employment, or engaged in private practice.

Col. G. Hutcheson, I.M.S., Inspector-General of Civil Hospitals, Assam, in his presidential speech at the first provincial conference in 1928, spoke as follows:—"I hope this may be the forerunner of a very successful and prosperous future for your Association, and I would appeal to all Licentiates in the Province to enlist themselves as members as soon as possible. So far, out of about 350 Licentiates, only 178 have responded to the call. I hope your Secretary will soon be able to report that all Licentiates have joined."

Mr. E. S. Roffey, M.L.C., Secretary, Assam Branch of the Indian Tea Association, in his presidential speech at the second provincial conference in 1929, held at Dibrugarh, spoke as follows:—"This, I think, proves that, as your chairman states, you have not been shouting as loudly as you should do. But, before you shout any louder, I should advise you to enrol the whole, or the greater majority, of the Licentiates in Assam as members of your Association. From the proceedings of your conference of last year, I have learnt that the Association was started 23 years ago, that no life in it was shown until 1924, and that last year, out of a total of 350 Licentiates in the Province, only 178, or about 50 per cent. were members of the Assam Branch. I sincerely trust for the sake of all of you that the membership has still further increased, as it is only by combination of the great majority of members of a profession, or industry, or community, that any good results can be attained by the officers of any association. Your officers cannot possibly have the same weight when representing the minority of your profession, as they would have in if they represented the majority."

I would appeal to those Licentiates in the Province who have not yet done so to join the Association, and support us in the programme outlined.—Yours, etc.,

SARAT CHANDRA CHAKRABORTY,  
Secretary, Silchar Branch.

8th November, 1929.

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

THE services of Lieutenant-Colonel W. M. Houston, M.B., I.M.S., are placed at the disposal of the Government of India, with effect from the 2nd August, 1929, and the unexpired portion of the leave granted to him in Government Notification, General Department, No. S. 20/10, dated the 26th February, 1929, is cancelled.

On relief by Lieutenant-Colonel I. D. Jones, I.M.S., on 13th November, 1929, Lieutenant-Colonel A. G. Tresidder, C.I.E., M.D. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., to officiate as Civil Surgeon, Nasik.

On return from leave Lieutenant-Colonel S. S. Vazifdar, M.R.C.P. (Lond.), I.M.S., to be Professor of Medicine and Clinical Medicine and Therapeutics, Grant Medical College and Physician and Superintendent, J. J. Hospital, Bombay.

On relief by Lieutenant-Colonel M. J. Holgate, I.M.S., Lieutenant-Colonel D. D. Kamat, B.A., I.M. & S. (Bom.), L.R.C.P. & S. (Edin.), I.M.S., to be Civil Surgeon, Surat.

On return from leave on 2nd November, 1929, Lieutenant-Colonel A. N. Thomas, D.S.O., M.B., B.S. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., to be Presidency Surgeon, Bombay, with attached duties.

On relief by Lieutenant-Colonel D. D. Kamat, I.M.S., Lieutenant-Colonel S. J. Bhathena, L.R.C.P. & S. (Edin.), L.F.P.S. (Glas.), I.M.S., to officiate as Civil Surgeon, Thana, *vice* Mr. C. T. Dhruv, B.M.S., reverting.

On relief by Lieutenant-Colonel A. G. Tresidder, C.I.E., I.M.S., Lieutenant-Colonel K. G. Gharpurey, B.A. (Cal.), L.R.C.P. & S. (Edin.), L.F.P. & S. (Glas.), I.M.S., to be Civil Surgeon, Ahmednagar.

Lieutenant-Colonel R. S. Townsend, I.M.S., Civil Surgeon, is transferred from Mussoorie to Gorakhpur.

On return from leave on 1st November, 1929, Lieutenant-Colonel M. J. Holgate, O.B.E., M.B., B.S. (Lond.), I.M.S., to officiate as Civil Surgeon, Sholapur, until such time as Major R. H. Candy, M.B., B.S. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., goes on leave when he will officiate as Civil Surgeon and Superintendent, Medical School and Mental Hospital, Ahmedabad.

On relief by Lieutenant-Colonel E. S. Phipson, D.S.O., M.D. (Lond.), M.R.C.P. (Lond.), D.P.H. (Lond.), D.T.M. & H. (Lond.), I.M.S., Major A. C. L. O'Shee Bilderbeck, M.B., B.S. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.P.H. (Camb.), D.T.M. & H. (Lond.), I.M.S., to officiate as Port Health Officer, Bombay, *vice* Major P. H. S. Smith, M.B., I.M.S.

On relief by Lieutenant-Colonel A. N. Thomas, I.M.S., Major C. M. Plumptre, M.R.C.S. (Eng.), L.R.C.P. (Lond.), F.R.C.S.E., I.M.S., to officiate as Civil Surgeon and Superintendent, Medical School and Mental Hospital, Hyderabad, pending further orders, *vice* Lieutenant-Colonel M. S. Irani, F.R.C.S.E., L.F.P. & S. (Glas.), I.M.S., reverting to Matheran.

On return from leave Major B. H. Singh, M.C., I.M.S., was appointed to be a Resident Medical Officer (Physician) in the Medical College Hospitals, Calcutta, with effect from the forenoon of the 15th November, 1929.

Major A. S. Fry, I.M.S., was appointed to act as First Resident Surgeon, Presidency General Hospital, Calcutta, *vice* Major S. A. McSwiney, I.M.S., transferred.

Major S. A. McSwiney, M.B., F.R.C.S.I., I.M.S., is appointed to act as Civil Surgeon of Bakarganj, with effect from the afternoon of the 8th August, 1929, *vice* Lieutenant-Colonel K. S. Thakur, I.M.S., granted leave.

Major T. S. Shastri, I.M.S., on return from leave, to act as District Medical Officer, North Arcot, and Superintendent, Government Headquarter Hospital, Vellore.

Major H. K. Rowntree, M.C., M.B., I.M.S., Civil Surgeon, Simla East, is appointed to hold charge of the duties of Health Officer, Simla, in addition to his other duties, until further orders.

On return from leave on 3rd November, 1929, Major A. H. Harty, M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., to



officiate as Resident Medical Officer, St. George's Hospital, Bombay.

On return from leave on 29th November, 1929, Major W. C. Spackman, M.B., B.S. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), L.T.M. (Lond.), I.M.S., to officiate as Civil Surgeon, Belgaum, pending further orders.

On relief Major B. Z. Shah, M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., to officiate as Superintendent of Mahableshwar.

The services of Major H. S. Anand, M.B., Ch.B., D.P.H., I.M.S., Health Officer, Simla, are placed temporarily at the disposal of the Government of the Punjab, until further orders.

The services of Major A. Y. Dabholkar, M.C., M.B., I.M.S., are placed temporarily at the disposal of the Government of Bombay for employment in the Public Health Department, with effect from the date on which he assumes charge of his duties.

#### LEAVE.

In modification of Government Notification, General Department, No. S.20/10, dated the 28th September, 1929, Brevet-Colonel F. P. Mackie, O.B.E., K.H.S., I.M.S., has been granted, with effect from 8th November, 1929, leave on average pay for 3 months and 29 days, combined with such leave on half average pay as will bring the total of the period of leave to one year.

Lieutenant-Colonel K. S. Thakur, I.M.S., Civil Surgeon, Bakarganj, is granted combined leave for 12 months, with effect from the 9th August, 1929.

Lieutenant-Colonel C. H. Barber, D.S.O., I.M.S., Civil Surgeon, Naini Tal, is granted combined leave for 12 months, with effect from 20th November, 1929.

Major S. N. Mukherji, I.M.S., Superintendent, Campbell Medical School and Hospital, is allowed leave for one year, with effect from the 15th December, 1929, or any subsequent date on which he may avail himself of the leave.

#### PROMOTIONS.

*Captain to be Major.*

J. H. Barrett. Dated 2nd November, 1929.

### NOTES.

#### THE ROYAL BATHS, HARROGATE.

We have received from the General Manager, Harrogate Corporation, a very attractive and interesting booklet on the subject of these world-famed baths. There is no need for the invalid from India to go to continental spas, for Harrogate caters especially for cases of intestinal disorder, hepatitis, rheumatism in its many forms, the after effects of malaria, and tropical neurasthenia. In an introductory note Sir Arbuthnot Lane comments on the dangers of dosing patients with constipation with irritant purgatives and speaks very highly of the sulphur waters of Harrogate.

There is no special season at Harrogate, whilst its eighty-eight medicinal springs are all natural and are constant in flow. The sheet anchor of the Harrogate "cure" is the sulphur water treatment, but there is also available every mode of treatment given at continental spas. Harrogate is famous indeed for the variety and quality of the medicinal waters there, for the class of attendants giving the treatments, and for its pleasant and bright climate. The staff at the Royal Baths number nearly two hundred, and, unlike those of other spas are not simply persons engaged for the season, but have all received a full nursing and medicinal training. The cost of the different cures is considerably lower than is popularly supposed to be the case in connection with spas; thus the sulphur baths only cost 12s. a week, and the more elaborate treatments 25s. a week. Accommodation in the town at private hotels, boarding houses, etc., can be obtained at from 3½ guineas a week upwards.

In addition to its medicinal springs, Harrogate has a splendid and bracing climate, whilst the pleasure seeker,

the golf and tennis enthusiast, are specially catered for. It is also a motoring centre within easy reach of many interesting places, whilst excellent schools and educational facilities are available.

A second interesting booklet deals with the medical aspects of the Harrogate cure. The many medicinal springs of Harrogate owe their existence to a vast store of soluble minerals of varied nature at great depths below the surface,—sufficiently deep to result in a fairly constant temperature in the springs throughout the year. The saline sulphur baths are used chiefly in the treatment of gout, rheumatism, hepatic disorders, and skin diseases; the alkaline sulphur baths are used in such skin disorders as eczema, psoriasis, acne, lichen planus, etc., whilst constant, interrupted, and sinusoidal currents are available for treatment of muscular and neuritic types of disorder. Carbonic acid, "Nauheim" baths are used for heart diseases and rheumatism. Other treatments used are massage douches, the Plombières treatment, peat baths, local steam baths—the Berthollet treatment, diathermy, Bergonie treatment, wax baths for dealing with stiff and painful extremities, and Turkish baths.

Those of our readers who are contemplating sending patients Home for spa treatment will do well to write for a copy of both brochures.

#### THE SQUIBB BUILDING.

MESSRS. E. R. SQUIBB & SONS, are one of the largest and best known American chemical manufacturing firms, and their dental cream, milk of magnesia, and other products are well known. The firm has recently decided to move into new quarters in the Plaza section of Fifth Avenue in New York. The new building is a typical skyscraper of 32 stories, of which E. R. Squibb & Sons will occupy 12, the rental being a sum of \$7,000,000 for a period of twenty-one years. The new building is to be named the "Squibb Building" in honour of its chief tenants.

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# Original Articles.

## CHOLERA IN A KHASI VILLAGE AND ITS TREATMENT WITH BACTERIOPHAGE.

By J. MORISON,

LIEUTENANT-COLONEL, I.M.S.,

Director, King Edward VII Memorial Pasteur Institute  
and Medical Research Institute, Shillong,

B. K. PAL CHOUDHURY, B.SC., M.B. (Cal.),

and

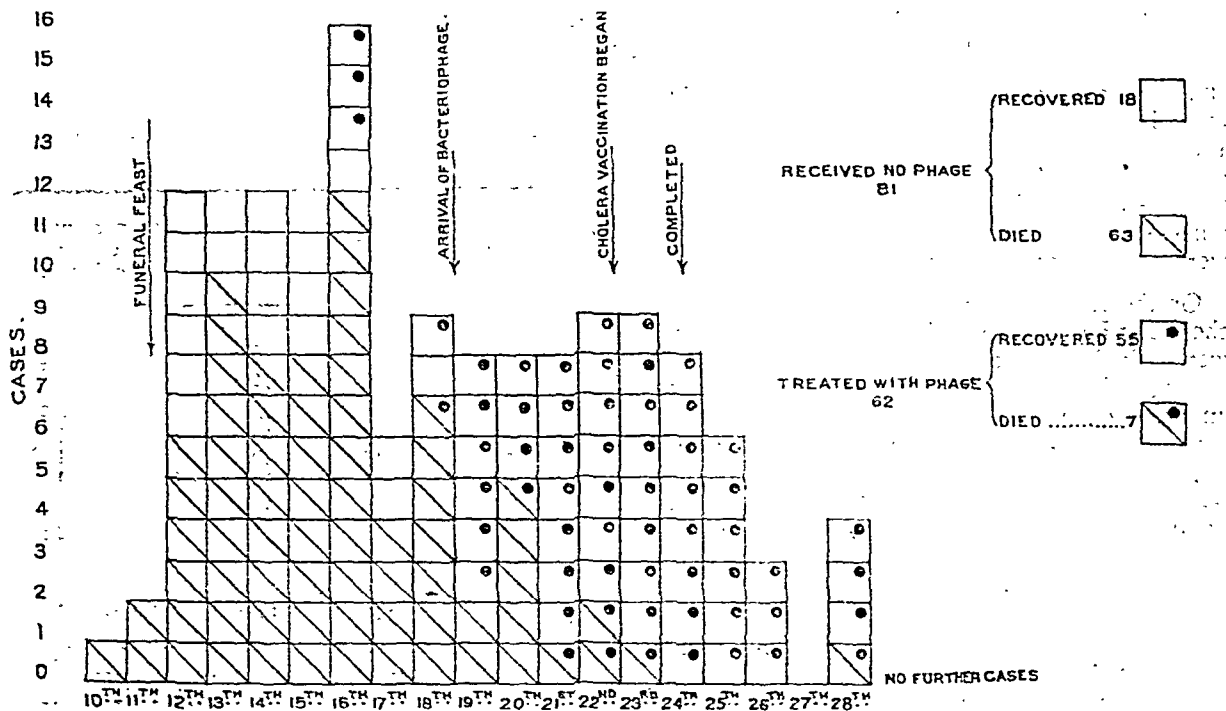
SUB-ASSISTANT SURGEON M.D. H. RAHMAN.

JAKREM is a village in the Khasi Hills 16 miles by road and twenty-five by footpath south-west of Shillong. It consists of 142 houses and has a population of 744. Never in the memory of the villagers has it been visited by cholera. On the 3rd October, 1929, eleven men went to seek work two days' march south to Maodon, adjacent to the plain of Sylhet. On their arrival they found cholera in Maodon and two neighbouring villages and, after staying one night, they returned

together with one man from Sngimowlein. About two miles from Jakrem this man left the party, his path diverging, and very soon after his arrival home he died of cholera; there were four more deaths from cholera in Sngimowlein. The Jakrem party, however, were met by the village elders and were forbidden to enter Jakrem. They remained where they were for two days while an egg-breaking ceremony was held at Jakrem to determine whether the cholera demon (*ka khlam*) was with the party. The cholera demon has six hands but no legs. According to the Khasis "*ka khlam* resides in the plains and can only leave the plains and climb the hills to Jakrem on the shoulders of a Khasi." The break of the egg showed that the demon was not with the party and they were then allowed to resume their journey to Jakrem. On the way they were met by one Saboo of Jakrem, who had a paddy field and a shelter near by, and in his field they all fed together and ate food which had been prepared at Maodon. They all reached Jakrem that evening (10th October).

That night Saboo was seized with vomiting and purging and the following day he died. Relying on the egg ceremony, it was held that Saboo could not have died of cholera and his body, instead of being buried as is done when one dies of cholera, was given a ceremonial cremation. Saboo was a man of importance so the cremation was followed by a big feast. Late that night Saboo's son and a neighbour fell ill

### CHOLERA IN JAKREM VILLAGE.



October 1929.

*Distribution of Cholera in Jakrem, October 1929.*

House No.	Inmates.	Cases.	Deaths.	House No.	Inmates.	Cases.	Deaths.	House No.	Inmates.	Cases.	Deaths.	House No.	Inmates.	Cases.	Deaths.
1	4	..	0	37	4	2	2	73	6	..	..	109	6	2	0
2	3	..	..	38	6	..	..	74	7	..	..	110	3	..	..
3	6	..	..	39	4	4	1	75	8	3	1	111	7	..	..
4	2	..	..	40	3	2	1	76	3	..	..	112	8	..	..
5	12	4	2	41	6	1	1	77	6	1	0	113	2	..	..
6	5	..	..	42	11	6	4	78	6	1	1	114	2	..	..
7	8	1	0	43	9	1	..	79	3	..	..	115	4	..	..
8	5	2	1	44	4	..	..	80	2	..	..	116	8	..	..
9	4	..	..	45	5	..	..	81	2	..	..	117	4	..	..
10	4	2	0	46	7	..	..	82	6	1	1	118	7	..	..
11	7	5	4	47	2	..	..	83	5	0	0	119	4	..	..
12	6	5	1	48	9	8	1	84	4	1	0	120	4	..	..
13	5	2	1	49	1	..	..	85	7	..	..	121	6	..	..
14	8	..	..	50	7	5	2	86	2	1	0	122	7	1	..
15	5	..	..	51	8	3	1	87	2	..	..	123	2	..	..
16	5	..	..	52	2	1	1	88	5	3	3	124	3	1	0
17	5	..	..	53	7	1	1	89	8	2	2	125	6	2	1
18	6	2	2	54	9	1	0	90	4	..	..	126	10	1	1
19	8	..	..	55	6	..	..	91	7	3	..	127	5	1	1
20	3	..	..	56	9	6	6	92	2	..	..	128	3	..	..
21	3	1	0	57	6	1	1	93	4	2	0	129	3	..	..
22	6	..	..	58	5	2	2	94	5	1	0	130	10	..	..
23	4	..	..	59	5	1	0	95	6	1	0	131	6	..	..
24	4	1	1	60	1	..	..	96	10	4	2	132	6	5	4
25	8	1	0	61	6	2	1	97	10	..	..	133	6	2	1
26	8	..	..	62	5	..	..	98	3	2	1	134	4	1	0
27	10	3	1	63	7	..	..	99	5	1	1	135	6	1	1
28	7	..	..	64	3	..	..	100	7	..	..	136	10	..	..
29	4	..	..	65	5	5	2	101	1	..	..	137	6	2	0
30	10	..	..	66	4	..	..	102	5	2	1	138	1	..	..
31	5	..	..	67	7	3	2	103	5	..	..	139	5	..	..
32	5	..	..	68	6	1	0	104	10	3	1	140	1	..	..
33	7	1	..	69	4	..	..	105	3	..	..	141	10	..	..
34	2	..	..	70	4	..	..	106	10	1	1	142	11	..	..
35	2	2	2	71	4	1	1	107	11	..	..				
36	3	1	..	72	2	..	..	108	4	1	0				

and both died on the 11th. On the 12th there were 12 cases and the epidemic which comprises 143 cases with 70 deaths continued till the 28th (see Graph). Two of the party who had gone to Maodon took ill, the one on the 15th and the other on the 16th. Both died on the 17th. There were no cases of dysentery.

On the 12th it was realised that the disease was cholera. Panic seized the village, and all who were able fled to the surrounding fields and woods leaving behind them the sick, the dying, and the unburied dead.

The village teacher and the family of the late *siem* (chief) are Christians; they did not attend the feast, they remained in the village and none of them got cholera. A neighbouring hamlet, "Smithnah," about one mile from Saboo's house, took no part in the feast and not one of the 44 inhabitants have had cholera. Saboo's house is in the western section of Jakrem. This section is separated from the eastern by a small valley. From the western section every house was well represented at the feast, while from the eastern section only one or two came from each house and many houses sent none. During the first five days of the epidemic there were 29 cases from the west section and 9 cases from the east.

## JAKREM CHOLERA.

*Incidence of cholera on households of different sizes.*

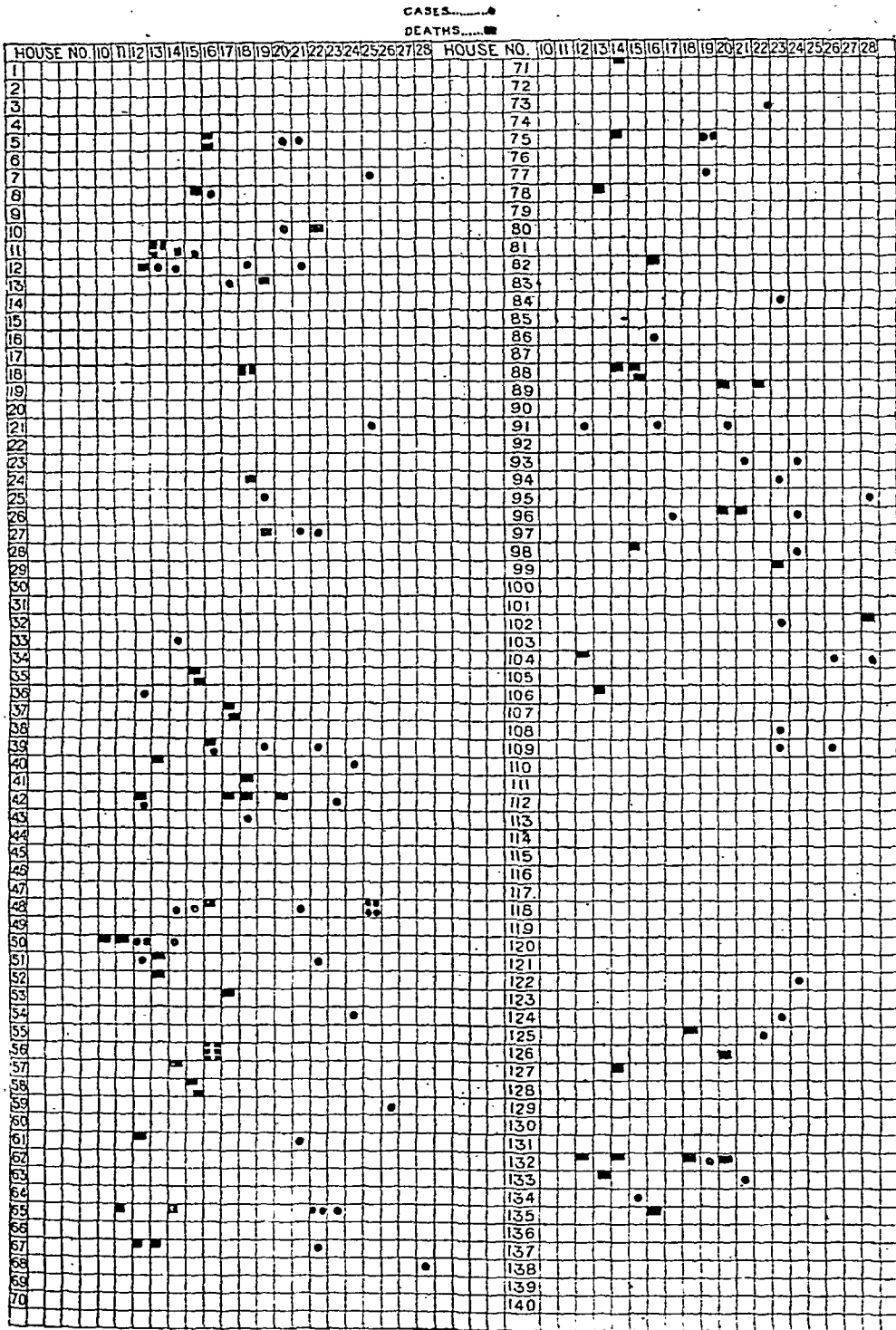
Number of persons in house.	Number of houses.	Number of cases of cholera.	Average number of cases per house.
1	5	0	0
2	14	4	0.28
3	14	7	0.5
4	22	15	0.68
5	21	20	0.95
6	23	30	1.3
7	15	19	1.27
8	10	10	1
9	4	16	
10	10	12	2.1
11	3	6	
12	1	4	
TOTAL	142	143	Average 1.007

Houses with 0 case	..	..	76
" " 1 "	..	..	31
" " 2 cases	..	..	17
" " 3 "	..	..	7
" " 4 "	..	..	3
" " 5 "	..	..	5
" " 6 "	..	..	2
" " 7 "	..	..	0
" " 8 "	..	..	1

### Incidence of Cholera in the Houses.

Western Sec., Houses 1—83.  
October 1929.

Eastern Sec., Houses 84—142.  
October 1929.



A few people from Nongpenden, two miles away, joined the feast and two of them died of cholera six days later.

For the feast two cows and many pigs were killed. The feast consisted of cooked meat, potatoes, rice and rice beer (*ka kiad*). No milk or milk foods were taken.

There is no common water supply for the village. Water is drawn from small springs, three or four houses using water from the same spring. It was noted that unaffected houses and infected houses in several instances used the same spring. Flies were notably absent.

Saboo's wife attended her husband during his illness and took a leading part in the preparation of the feast. She herself did not get cholera. Women and children suffered heavily; among 70 deaths there were 20 men, 35 women, and 15 children under twelve years of age.

All the food for the feast was cooked, hence infection must have taken place during the distribution. The food at the feast was, and is normally in a household, distributed in small brass dishes. Larger pots were used for the cooking. Dr. Choudhury and Dr. Rahman twelve days later each happened to see these same dishes being used to remove the excreta from helpless patients and, on enquiry found that this frequently occurred and that the dish after scouring with sand and water was returned to its ordinary use. Saboo's wife could not remember having used such dishes for this purpose but apparently was not sure whether this had occurred.

Information of this outbreak reached the Rev. J. J. M. Nichols Roy at Shillong on the 16th October and the messengers were at once sent to the Pasteur Institute. On the morning of the 17th these men, taking with them a supply of cholera-dysentery bacteriophage, left for Jakrem, arriving there late that evening. Within three days nineteen patients had received bacteriophage. One of these died, but the rest recovered. By midday on the 22nd Dr. Pal Choudhury from the Pasteur Institute and Sub-Assistant Surgeon Md. Rahman of the Gauhati epidemic unit arrived, and all the survivors on that day and all taking ill subsequently received the bacteriophage. The villagers took courage and began to return, and that evening, after the more desperate cases were attended to and the burial of the dead was arranged, cholera vaccination was begun. By the 24th most of the villagers had been inoculated.

If we divide the epidemic into those taking ill between the 10th and the 17th October, when no bacteriophage was available, and those falling sick between the 18th and the 28th when the bacteriophage was at hand, we have:—

	Cases.	Deaths.	Mortality.
Group I .. .. .	71	51	71.8
Group II .. .. .	72	19	26.4

Or taking the cases receiving and not receiving bacteriophage:—

	Cases.	Deaths.	Mortality
Without bacteriophage ..	78	63	80.8
Receiving bacteriophage	65	7	10.8

Or taking cases falling ill on and after the 18th when bacteriophage was available:—

	Cases.	Deaths.
Not receiving bacteriophage ..	13	12
Receiving bacteriophage ..	59	7

According to Dr. Choudhury, who saw 54 cases, the cases were not dissimilar in initial severity to those he has seen elsewhere in Assam; but, be that as it may, the graph shows a sudden change in the character of the epidemic which at once followed the distribution of the bacteriophage on the 18th October. Six hundred and sixty persons were inoculated with cholera vaccine between the evening of the 22nd and that of the 24th. It is difficult to appraise the action of the cholera vaccine as the epidemic had already changed its character before vaccination began, and ceased on the fourth day after it had been completed.

The treatment with bacteriophage was simple. All food was withheld for the first day. As much water as the patient could sip or drink was given and with the water 2 ml. of bacteriophage of the combined cholera-dysentery strains were administered every 2 to 4 hours until the vomiting and purging ceased and urination began.

Five cases were given intravenous saline as well as bacteriophage and of these two died. More cases would have received this had it been possible to give it in the stress of the work. No other drug was used.

*Discussion.*—The epidemic occurred in virgin soil. From the start to the 9th day the mortality was maintained at a high level; on the 9th day 7 out of 9 cases taking ill died. With the introduction of the bacteriophage there was at once a change. A similar change happened in a smaller epidemic in Shillong, where of 21 cases receiving no bacteriophage 16 died, and of 6 cases that had bacteriophage 1 died.

d'Herelle believes that cholera epidemics are brought to an end by the development of bacteriophage in those who recover and its distribution by the agencies that distribute infection. To the development of the bacteriophage also he attributes the diminution in the mortality frequently observed towards the end of an epidemic. If this be true, then the administration of an active bacteriophage may have precipitated a development that, occurring more slowly, is normal to the disease. A sudden change in the character of the disease such as took place at Shillong and again at Jakrem is not a feature of cholera untreated or treated in the ordinary way.

The results at Jakrem were obtained under severe conditions. No nursing was possible. One of the deaths in the bacteriophage group was a man who, feeling hungry, got up and attempted to cook some food. He collapsed and died by the fireside, when, had he had some one to help him, he seemed on the fair way to recovery.

## NOTES ON THE PATHOGENESIS OF SPRUE AND THE ASTHENIC DIARRHŒA OF INDIANS.

WITH SPECIAL REFERENCE TO THE RÔLE PLAYED THEREIN BY AMŒBIASIS. THE PROBABLE IDENTITY OF THE TWO FORMER CONDITIONS, AND THEIR CONNECTION WITH ADDISONIAN ANÆMIA—SUBACUTE COMBINED DEGENERATION OF THE CORD—HUNTERIAN GLOSSITIS SYNDROME OF HURST.\*

By J. B. HANCE, O.B.E., M.A., M.D. (Cantab.), F.R.C.S.E.,  
MAJOR, I.M.S.,

Rajkot.

It is not without considerable trepidation that I put forward this paper for discussion before an audience which includes many clinicians and laboratory workers whose experience far exceeds my own. It concerns a subject which you, Sir, and your colleagues in Calcutta, have made peculiarly your own, and I hasten, therefore, to emphasize that these remarks are put forward in no spirit of dogmatism and express no fixed idea; but rather that they are made with the deliberate purpose of provoking discussion and of enabling me to profit by the views and experience of my audience in a class of case which is daily coming more into prominence and claiming more attention from our profession.

Briefly, the question which I have to bring forward for discussion is whether the time has not arrived to revise our conception of sprue and the so-called pernicious anæmia and asthenic diarrhœa of Indians, as separate clinical, ætiological and pathological entities, and to regard them as members, differing if at all, only in degree, of the syndrome Addison's anæmia, subacute combined degeneration of the spinal cord, and Hunterian glossitis, resulting from a combination of achlorhydria, or achylia gastrica, and intestinal infections by the hæmolytic streptococcus.

The term Addison's anæmia is used in this paper instead of pernicious anæmia. Addison first described what he termed idiopathic anæmia in 1847. Twenty years later Biermer wrote also upon the same subject, calling it pernicious anæmia; but, as Hurst has pointed out, "beyond the pernicious name he invented, he has added little to our knowledge of the subject."

While an infective basis for Addisonian anæmia had long been suspected, and in the case of subacute combined degeneration had been foreshadowed as far back as 1900 by Risien Russell, Batten and Collier (1900), it was not until the early years of the present decade that Hurst and his colleagues established that both these diseases are causally associated with intestinal infection with a hæmolytic streptococcus in the presence

of complete achlorhydria. The latter may be primary and constitutional, or secondary, following upon such conditions as alcoholic or toxic gastritis or carcinoma of the stomach.

These workers regard the hydrochloric acid in the gastric juice as an "antiseptic barrier" (Knott), the lack of which permits streptococci from the teeth, tonsils or nasal sinuses to gain access to the duodenum where they find in the alkaline products of proteolysis a favourable culture medium.

With regard to Hunterian glossitis, Hurst (1925) states that this was described by William Hunter as a sign of Addisonian anæmia; but the description fits equally the tongue conditions observed in sprue, asthenic diarrhœa and subacute combined degeneration. Its main characteristic is its smooth polished appearance due to the denudation of the filiform papillæ. It is seen at its extreme in the classical case of sprue and may be observed in all its phases in any of the conditions under consideration. It has frequently drawn my attention to a possible infection with the hæmolytic streptococcus which subsequent search has usually confirmed. For the sake of brevity, therefore, I shall henceforward refer to this syndrome of Addison's anæmia, subacute combined degeneration of the spinal cord, and Hunterian glossitis, as Hurst's syndrome.

With this advance in our knowledge of pathogenesis, we are justified in reviewing our data with regard to sprue and its associated conditions. The sprue-like diarrhœa of Addison's anæmia has long been recognized, and the Addisonian type of anæmia in sprue is equally well known. The latter is stressed by Acton and Knowles (1928), while the former is foreshadowed by Hurst (1922), who states that beyond Addison's anæmia, the only conditions in which a hæmolytic anæmia associated with megalocytosis which is typical of that disease occurs, are sprue and *Bothriocephalus* infection.

In Kathiawar asthenic and sprue-like diarrhœa appear to be so prevalent as almost to deserve the description endemic, and the foregoing considerations have prompted an analysis of the records of 26 consecutive cases for the purposes of this paper. So prevalent and well known is this condition that it is known in Gujarati as *Bombay-no pani*, from the belief that the causal agent is the water of Bombay! Whatever may have been the case in the past, it would seem to be an undeserved slur on the Bombay of the present, with its carefully protected water supply, since only two of the present series of cases developed the disease in that city. In all the remainder, the disease appears to have been contracted in Kathiawar.

I must at once admit that I have been unable to find any distinction, except in degree, between cases in this series which would be returned as typical sprue, and others which would be characterized as asthenic diarrhœa. In others again the anæmia has dominated the picture, and in

\*A paper read before the Medical and Veterinary Section of the Indian Science Congress at Allahabad on 3rd January, 1930.



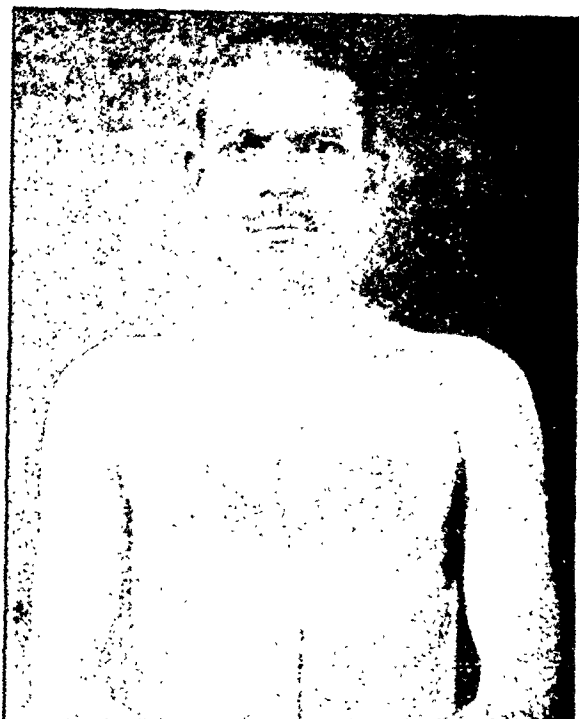
three the main symptoms have been nervous; but in all the clinical picture has been one of chronic wasting with flatulence and diarrhoea associated with true Addisonian anæmia and Hunterian glossitis. The evidence which has led me to put forward the suggestion that these two conditions are essentially identical in ætiology, pathogenesis, and treatment, and that they are phases of Hurst's syndrome, may be divided, for purpose of consideration, into clinical, pathological and therapeutic; and consideration has led me also to put forward the tentative suggestion that it is usually caused, at any rate in Kathiawar, by the co-existence of intestinal ulceration with the infection of these ulcers by a hæmolytic streptococcus. Further, whereas Acton and Knowles (1928) put forward the view that sprue is a sequel of bacillary dysentery, my evidence leads to the conclusion that, at any rate in the locality for which I speak, *Entamoeba histolytica* is much more often the culpable agent, since in 15 out of the 26 cases, or roughly 60 per cent., cysts of this organism were found; whereas in 15 cases examined for both amebic and by agglutination for bacillary dysentery, only two cases (12.3 per cent.) showed a positive agglutination, to *B. dysenteriae*, and in both cases the organism agglutinated was *B. flexneri*. Of the same 15 cases, 10 (or 66 per cent.) showed *E. histolytica* cysts. One case both harboured cysts and agglutinated the bacillus of Flexner.

This appears to me to point to the conclusion, reached by Hurst and his collaborators, that the streptococcus is the true culprit, and what I may term the "ulcerating organism" merely its vehicle, and ætiologically of secondary importance; since when putting forward laboratory evidence I shall show you that in only 3 cases of this series did we fail to isolate this organism. One of these cases is still awaiting a radiological dental survey, so we have not yet lost hope.

Turning now to the clinical aspect, the condition which I am discussing, like those comprising Hurst's syndrome, is a disease of middle age. The average age of the series of patients under review is 36, the oldest being 55 and the youngest 19, and the majority between 25 and 40: 23 were males and 3 females; but I do not place much ætiological significance on these figures, since even in Kathiawar, which is more liberal in this respect than Northern India, far fewer women than men consult a male doctor. Sprue, by some authorities, is considered to be a disease of the European resident in the tropics. My series contains only one European, but several patients presented typical clinical pictures of sprue. Hindus were twice as often affected as Mohamedans, this being approximately proportional to the class incidence of the population; but it has further the significance of vegetarians being twice as often affected as non-vegetarians. Sixteen were Hindus, 8 Mohamedans, 1 European and 1 an Indian Christian.

Addison, who described what he called idiopathic anæmia in 1847, wrote that it "occurs

chiefly in persons of a somewhat large and bulky frame and with a strongly marked tendency to the disposition of fat." More recently Hurst and Draper have amplified this description by noting that these patients approach the hyperpituitary type in appearance, having a wide facies, eyes set far apart, broad jaws and a wide costal angle. In the present series of cases I find the latter characteristics faithfully observed, as will be evident from the accompanying photograph but, owing presumably to the asthenic condition of the majority of the cases, bulkiness of frame cannot be called a characteristic, except in those members whose most prominent symptoms were referable to the nervous system.



The characteristic history is one of an antecedent digestive disturbance, which may have been frankly dysenteric, as in 11 cases of the present series, or merely looseness as in 9 others. This is followed by a continuance of digestive troubles, which in some consists in the passing of large pale "porridgey" or frothy stools in the morning, in others of a constant and irritating looseness throughout the day. The first of these categories may, and frequently does, progress into the second, and both may alternate with periods of constipation. In only two cases of the series was constipation noted as the prominent digestive symptom.

As the condition progresses soreness of the mouth and tongue is added to the picture, and this presents every degree of severity, from inconvenience in consuming hot or spicy food to a rawness which makes a purgatory of the taking of any food at all. Soreness may not be confined to the tongue but ulceration and rawness of the cheeks and lips may add to the patient's trials, and gives to the condition the expressive vernacular name of *munh*. As the disease progresses further, fatigue on exertion, breathlessness and

increasing pallor with a host of other symptoms supervene. Among the more characteristic of the later are irregular low fever, indigestion and flatulence, sternal pain, cedema of the feet and burning or tingling of the extremities, which may be followed, if the case is far advanced, by a definite ataxia.

On examination, besides the structural characteristics already noted we see an emaciated patient with the *facies Hippocratica*, of marked, often extreme, pallor, who may be a living skeleton, or again whose podgy bloated abdomen—sometimes revealing the peristalsis of the bowels beneath—may form a striking contrast to the emaciation of the rest of his frame. The pallor is extremely noteworthy and is of the typical lemon hue. In darker skinned persons difficulty is, of course, experienced in this respect, the complexion tending to assume a muddy chrome colour; but examination of the oral mucous membrane, and especially of the soft palate is an infallible guide. There the submucous fat takes on the classical yellow which Hurst (1922) states "affords just as good evidence of hæmolysis as the Prussian-blue reaction obtained in the liver and sometimes in other organs after death."

The teeth show the usual tartar and pyorrhœa of the Indian adult—and in some cases are very foul. On the other hand they may be surprisingly good. In 6 of the present series they are recorded as foul, in 3 fair, and in 7 good. The remainder are not noted upon. Speaking generally, and with the remark that I often differ materially from members of my staff in my estimation of dental condition, the teeth are poor and mostly infected.

The abdomen may in the earlier cases appear normal, but usually, as I have mentioned it is either distended, with or without visible subjacent peristalsis, or retracted. The liver and spleen are seldom notably enlarged, but there is often tenderness on deep pressure upwards into the right hypochondrium. An almost invariable sign is tenderness over, and thickening of the colon in one or other, or both, iliac fossæ, indicative of colitis; and in some cases the whole of the large intestine as far as the iliac colon is so thickened and tender that its location is evident on palpation.

The respiratory system is not usually conspicuously affected; but here a note of warning must be sounded. Two cases in the present series gave a history of cough with evening pyrexia which led to their admission as cases of suspected phthisis—a diagnosis which was only abandoned after repeated negative clinical, sputum and x-ray examinations, and upon the establishment of definite positive evidence of Hurst's syndrome. These cases showed a generalized bronchitis on examination. Similar instances have come into my experience in cases seen in consultation with other medical men, and of which unfortunately no record has been preserved; and there is undoubtedly danger of overlooking early cases of Hurst's syndrome if the glasses through which

one views them are too coloured by the prevalence of pulmonary tuberculosis.

Other respiratory symptoms which are not infrequent are dyspnoea on exertion—a sequel of the profound anæmia—and asthmatic attacks which, I conclude, are an expression of a streptococcal focus.

The most constant cardio-vascular symptoms are palpitation on exertion and sternal pain; and of physical signs the most notable is the so-called hæmic murmur. The heart sounds, especially the first, are also often poor in quality. The pulse is rapid, expressive of an attempt to maintain oxygenation with diminished hæmoglobin, and may be small and thready; occasionally it is intermittent.

The blood picture is the most striking feature of the case on examination. It is typical of the Addisonian or so-called pernicious anæmia; red cells greatly diminished, hæmoglobin also greatly reduced, but usually not proportionately, giving a colour index usually greater than unity. This, however, is by no means necessarily the case. Hurst (1922), Musser (1926) and others have noted this; and it is the experience of all clinicians that "Addison's anæmia, particularly in its early stages, and during the periods of remission, may present a blood picture far removed from what is considered to be typical of the disease." This is well illustrated in two of the present series, on whom repeated blood counts were carried out (Table I). The diagnosis must rest not upon the colour index, but upon the nature of the red cells observed. Poikilocytosis and anisocytosis are common. Megalocytes are invariable; and upon their presence alone a diagnosis of Addisonian anæmia may be reached. Normoblasts and megaloblasts may be observed. The former were not seen in the present series, the latter once.

There is also usually a more or less marked leukopenia, but the differential leucocyte count does not vary greatly from the normal.

The serum when separated has a characteristic yellowish tinge analogous to that observed in the subcutaneous fat.

Signs and symptoms referable to the nervous system may, or may not, exist according to the degree to which the disease has progressed. Five cases in the present series (20 per cent.) showed the paræsthesia of the extremities characteristic of early subacute combined degeneration of the cord, while two others were admitted with the second or ataxic phase of that disease well established.

As regards the urino-genital system there may be slight albuminuria; but casts are seldom seen, and when present are indicative of associated renal disease. Diminished menstrual flow or amenorrhœa is the rule in women.

Coming now to laboratory evidence, I must beg your indulgence, Sir, and that of my audience, if I deal more in actual figures than has heretofore been the case. The investigations, other than routine clinical and blood examination, which

TABLE I.

Serial No.	Name.	Caste, Sex, Age.	Abstract clinical history.	Date.	BLOOD EXAMINATION.				
					W. B. C.	R. B. C.	H. C.	Colour Index.	D. Lc.
1	A. A.	M. M. 35.	Weight on admission 79 lbs. Weight on discharge 86 lbs.	31-10	$3.628 \times 10^6$	..	Per cent 55	0.7	Per cent. Poly. 38 Lymp. 18 L. M. 4 Eos. 40
				11-11	$2.352 \times 10^6$	..	55	1.18	
				18-11	$2.360 \times 10^6$	..	60	1.3	
				26-11	$2.540 \times 10^6$	..	60	1.2	
				2-12	$3.050 \times 10^6$	..	60	1	
				9-12	$3.212 \times 10^6$	..	60	0.9	
2	U. E.	M. M. 35	.....	5-11	$2.496 \times 10^6$	..	35	0.7	Poly. 68 Lymp. 26 L.M. 4 Eos. 2
				11-11	$2.216 \times 10^6$	..	30	0.7	
				18-11	$2.216 \times 10^6$	..	56	0.8	
				26-11	$3.128 \times 10^6$	..	60	0.9	
				2-12	$3.421 \times 10^6$	..	70	0.9	
				9-12	$3.812 \times 10^6$	..	70	0.9	

have been performed are:—blood culture, stool examination and culture, examination of the gastric juice for free hydrochloric acid, urine culture and, occasionally, culture from the roots of extracted teeth; and the point which I wish at once to make is that in 23 out of the 26 cases, or practically 88.5 per cent., a hæmolytic streptococcus was isolated on culture from either blood, stools, or teeth.

Of these 23 positive cultures 6 were from the blood, and 17 from the stools, while 2 cases showed this organism in both blood and stools, and one in blood, stools and teeth.

Coming now to the "ulcerative organism" or vehicle of the streptococcus, in all the cases stool examination and culture was performed. In 15 (60 per cent.) *E. histolytica* cysts were found and in 1 case, nearly 4 per cent., the bacillus of Flexner was isolated. In 15 of these cases the agglutination test for dysentery bacilli was also performed and was found positive to the bacillus of Flexner in 2 cases, one of which also harboured *E. histolytica* cysts. Thus *E. histolytica* was the presumptive culprit in 14 out of 25 cases or 56 per cent., the bacillus of Flexner in 2 out of 25 cases, or 8 per cent., and both in 1 out of 26, or nearly 4 per cent. In the remaining 32 per cent. organisms of neither disease were found and reliance has to be placed upon history. Twenty-one cases in all, or 80 per cent. either revealed evidence, or gave a history, of dysentery. *Monilia psilosis* was not isolated in any case of the series.

Examination of the gastric contents by Ewald's test meal—fractional test meals unfortunately being impracticable—was performed in 21 cases. In 18 (86 per cent.) there was complete absence of free hydrochloric acid, and in the remaining three (14 per cent.) there was marked deficiency.

Coming now to the therapeutic aspect, the system of treatment which has been followed may be summed up as the combined treatment of chronic dysentery and of Hurst's syndrome. It

has been simultaneously to attack the ulcerating organism and the streptococcus, with appropriate anti-dysenteric treatment combined with autogenous anti-streptococcal vaccine;—emetine and kurchi where the *Entamoeba histolytica* was found, serum and vaccine where the bacillus of Flexner was observed. Coincident with the attack on the organisms, the absent or deficient hydrochloric acid was replaced or supplemented by the administration of the pharmacopœial dilute hydrochloric acid by the mouth, and the stimulation of the hæmatopoietic function by the liver diet of Minot and Murphy, and the exhibition of iron and arsenic. In two very severe cases this has been supplemented by the transfusion of blood from appropriate donors.

My reason for claiming therapeutic evidence in support of my suggestion is that with the exception of one case who was practically moribund on admission, with a count of only 368,000 red cells per c.mm. and a hæmoglobin percentage of 10, and two others who refused to stay in, every case showed immediate and marked subjective improvement, while the objective improvement, though variable in detail in different cases, was no less marked. Of the exceptions, the first case after a considerable subjective, and slight objective, improvement after transfusion died following the first injection of autogenous vaccine. The dose given was only  $\frac{1}{2}$  million organisms, but even this was probably too great for his extreme cachexia since he progressively sank thereafter and died 24 hours later in spite of all restorative measures.

In the remainder the improvement was immediate and in some cases dramatic. Soreness of the tongue abates and disappears. Diarrhœa ceases, and formed brown motions replace the pale yellow liquid or bulky grey porridgey stools. Flatulence and dyspepsia cease as if by magic after a few administrations of acid during meals. The weight rises with surprising suddenness. In most cases also there is a dramatic change in the

blood picture, very marked in the earlier phases, less so as the count approximates to the normal; and the more marked the anæmia on admission the more striking is the earlier improvement. In Table II, I give the rosy side of the therapeutic picture—two cases whose improvement was immediate, dramatic and sustained. The side which is not so rosy has already been presented in Table I, showing two cases whose blood picture fluctuated for some time. In one case it did not improve, in the other it settled down later to a steady improvement. In spite of this coyness in the blood picture, other symptoms progressively improved and patients gained in weight and condition and were discharged to continue liver and acid in their homes. It is noteworthy that the first of these cases, whose blood reaction was not satisfactory, was one of the three cases in which we failed to isolate a hæmolytic streptococcus.

and Addison's anæmia. Acton and Knowles (1928) have produced a formidable series of charges against the hæmolytic streptococcus and have considered sprue as a sequel of bacillary dysentery. Discrepancies there admittedly are. Hurst and his colleagues incriminated a long-chained hæmolytic streptococcus from the duodenum. My cases gave a short-chained organism from the blood, stools, or teeth, and I was unable to examine the duodenal contents. Again in only 8 of my cases was the classical sprue stool recorded, the others were cases of colitic diarrhœa. Here, however, I am on common ground with others. Musser (1926) states that Ashford, in an investigation of 616 cases of sprue, found the classical stool in only 19 per cent. In my cases it was shown in 40 per cent. of those whose main symptoms were gastro-intestinal, and in 32 per cent. of the whole series.

TABLE II.

Serial No.	Name.	Caste, Sex, Age.	Abstract clinical history.	BLOOD EXAMINATION.					
				Date.	R.B.C.	W.B.C.	H.C.	Colour Index.	D. Lc.
1	J. V. M.	H. M. 22	Weight on admission 83 lbs. Weight on discharge 87 lbs.	14-2	$1.896 \times 10^9$	6,250	Per cent.		Per cent.
				21-2	$2.121 \times 10^9$	..	70	1.8	Poly. 62
				28-2	$3.141 \times 10^9$	..	70	1.6	Lymp. 37
				8-3	$3.591 \times 10^9$	..	75	1.1	L. M. 0
				16-3	$5.334 \times 10^9$	..	85	1.03	Eos. 1
2	N. C.	H. M. 22	Weight on admission 100 lbs. Weight on discharge 110 lbs.	20-2	$1.028 \times 10^9$	4,062.5	25	1.2	Poly. 54
				26-2	$3.010 \times 10^9$	..	65	1.1	
				5-3	..	..	..	1.0	Lymp. 42
				12-3	$3.120 \times 10^9$	..	65	1.2	
				19-3	$3.020 \times 10^9$	..	..	1.2	L.M. 4
				26-3	$3.532 \times 10^9$	..	60	1.1	
				2-4	$3.532 \times 10^9$	..	70	0.8	Eos. 0
				9-4	$3.941 \times 10^9$	..	75	0.9	
				23-4	$4.120 \times 10^9$	..	75	0.9	
				29-4	$4.821 \times 10^9$	..	80	0.9	

Summarizing, I have endeavoured to place before you a series of 26 cases, of which 20 were either sprue or asthenic diarrhœa, 3 were subacute combined degeneration of the cord, and 3 others frank cases of Addison's anæmia, and all of which showed, in greater or lesser degree, evidence of Hurst's syndrome. I have also attempted to show that chronic dysentery—in this series, usually amœbic,—was an established precursor in 68 per cent. of the cases and was a presumptive antecedent in 80 per cent.

Hurst and others have established the guilt of the hæmolytic streptococcus combined with achlorhydria for the conditions comprising their syndrome; and I have tried to place before you to-day evidence which appears to me to throw a strong suspicion on that organism with regard to sprue and asthenic diarrhœa, sharing as they do with frank cases of Hurst's syndrome in symptoms, in organism isolated, and in reaction to treatment.

The idea is not new. Musser (1926) in an admirable paper canvasses the identity of sprue

What, then, is the factor determining the character of the stool in these cases? I can but suggest that as in Addison's anæmia the hæmolytins are predominant in the streptococcal toxins and the neutrotoxins secondary—the reverse being the case in subacute combined degeneration—one must assume that in cases with classical sprue stools these organisms also produce a toxin specially selecting the pancreas for attack. An alternative explanation is one suggested by a case which I was lucky enough to see in Guy's Hospital when last at Home. A case of typical sprue developed acute appendicitis and at the operation the glands at the root of the mesentery were observed to be greatly enlarged. The lacteals in the mesentery of the small intestine were also found to be dilated up to the size of a lead pencil, presumably due to obstruction of their contents by the enlarged glands. The natural result was the failure to absorb the split fats which were passed in the stool. It is possible that long continued enteritis with secondary adenitis may in some cases determine the fatty character of the

stool of sprue. But these discrepancies appear to be only matters of detail, and not seriously to affect the main clinical picture, which seems to me to be most easily appreciated on the assumption which I have suggested, namely, that sprue and asthenic diarrhoea are identical and that both must be added to Hurst's syndrome.

I admit that the evidence is not complete—outside of purely laboratory investigations it seldom is; and this is a clinical series, based on observations which are largely clinical. My excuse and my justification is that it was by clinical observations that those whom Sir Humphry Rolleston has described as "our fathers in physic" arrived at the conclusions on which the science and art of modern medicine are based. From Hippocrates, Galen and Vesalius down to Addison and Bright and to others who are still with us, their clinical observations stand to-day as models of philosophic investigation, to inspire those of us who follow after. The present paper is a stumbling and humble attempt so to follow. No one is more conscious of its many imperfections and of the many gaps left in it than myself, and no one awaits with more eagerness the opinions and experience of others which I hope will be given to me in the ensuing discussion.

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## URTICARIA DUE TO FILARIAL TOXIN.\*

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#### INTRODUCTION.

DURING the course of our researches, the senior author (1925) pointed out the necessity to look carefully for the possibility of filarial infection giving rise to giant urticaria. Though as yet no

relationship has been established between filariasis and giant urticaria, one important result of this investigation which lasted over the period 1926 to 1929 was the definite finding of the relationship of urticaria to filarial infection.

During this period, we have observed several characteristic cases of urticaria which could be definitely ascribed to infection by *Filaria bancrofti* and as these cases are very remarkable—evidently the first records of such a manifestation of filarial infection—it may be of interest to discuss them here. Seven of the typical cases that were under observation during this period are discussed below:—

#### HISTORY OF CASES.

*Case 1.*—Mrs. C. Anglo-Indian, aged 60, was admitted into the hospital with a history of urticarial eruption appearing all over the body but chiefly on the extremities. The urticaria appeared in crops every day for three months. The patient was then free from urticaria for a period of two months, when she again had a recurrence. Eosinophiles—6 per cent.

*Case 2.*—Miss S. E., aged 20, had attacks of filarial lymphangitis of the left forearm during 1928, and had a course of vaccine treatment. She was free from these attacks of lymphangitis for a whole year, and was then admitted into the hospital (September, 1929), on account of urticaria of the left forearm. The urticaria appeared once every fortnight with slight febrile disturbance. Eosinophiles—9 per cent.

*Case 3.*—Miss G. Anglo-Indian, aged 12, was admitted into the hospital in September, 1929, on account of urticaria which was very periodic and appeared regularly every morning some time before food and gradually subsided during the course of the day. The duration of such attacks was two months. Eosinophiles—10 per cent.

*Case 4.*—C. S. M., Indian Christian, aged 25, male, was admitted into the hospital in August, 1929, with a severe crop of urticarial eruptions all over the body and extremities. He gave a history of slight rise of temperature, which was not recorded, during the course of the eruption. There was no rise of temperature during his stay in the hospital. Microfilariae were present in the peripheral blood. Eosinophiles—5 per cent. This patient was re-admitted into the hospital exactly one month later with a filarial abscess in the right inguinal region which was operated upon and adult filariae were recovered from it. This case has been previously reported in this journal (Acton and Rao, 1929).

*Case 5.*—B. B. R., Hindu, aged 14, male, was suspected to be suffering from epidemic dropsy and was admitted into the hospital. On examination, it was found that he was not suffering from epidemic dropsy. It was discovered that he had transient urticarial eruption appearing on all the extremities, lasting from 4 to 9 p.m. daily, and subsiding thereafter, and slight puffiness of both the lower extremities towards evening every day. These periodic urticarial attacks continued for over a month after admission into the hospital. These attacks gradually diminished after the commencement of a course of treatment with filarial vaccines and soamin. Microfilariae were present in the peripheral blood taken at night. Eosinophiles—9 per cent.

*Case 6.*—Miss C. S. F., Anglo-Indian, aged 40, was admitted into the hospital with an attack of filarial lymphangitis of the left leg. During her stay in the hospital she had an attack of urticarial eruption, limited to the left leg and combined with a slight rise of temperature (99.5°F.). In this case no microfilariae were found in the peripheral blood at night. Eosinophiles were 3 per cent.

*Case 7.*—Mrs. X, Jewess, aged 40, had an attack of urticarial eruption in December, 1929. The attacks appeared once every month and lasted for four days. This case is being further investigated.

\* Being a paper read before the Medical and Veterinary Section of the Seventeenth Indian Science Congress. Allahabad, January, 1930.

## DISCUSSION OF RESULTS.

In all these cases a thorough routine examination of the blood, stools and urine was carried out to ascertain whether any known specific infection was present to account for the urticaria. Secondly, dermal tests (testing the different food proteins on the skin of the forearm) were carried out in several of these cases and the results were very varying; for instance, in case No. 1 reaction followed most of the food tests. In case No. 4, on the other hand, the tests were entirely negative except for the fowl group. Excluding case No. 1 no definite sensitiveness to particular food proteins was found, and even this case (No. 1) is probably an instance of hypersensitiveness, since she showed marked reaction to almost every one of the tests. Thirdly, all the cases discussed, except Nos. 6 and 7, showed microfilariae in the peripheral blood taken at night. Lastly, all the cases had a moderate degree of eosinophilia.

The presence of microfilariae in the blood is direct evidence of filarial infection. The history of filarial lymphangitis, the concurrence of these attacks with urticaria, the absence of any specific infection, or evidence of any relation of the attack to any particular food indicate that the attacks of urticaria are filarial in origin. This is further borne out by the presence of a moderate eosinophilia (less than 15 per cent.) and the periodicity of the attacks.

It was mentioned before that the attacks of urticaria showed a periodicity in the cases under observation. In cases Nos. 2 and 7, the attacks came on once a fortnight or once a month. This periodicity and the evidence of febrile disturbance together with the previous history of filarial lymphangitis, indicate that the attacks of urticaria are probably mild manifestations of filarial lymphangitis. In case No. 6, after several severe attacks of filarial lymphangitis, the attack became much milder and finally only urticaria occurred which was restricted to the affected limb.

In cases Nos. 3 and 5, there was a daily periodicity of mild urticarial attacks, limited to the limbs; in the former the eruption appeared in the mornings, and in the latter during the evenings. Here, their appearance was without any relationship to food.

Case No. 4 had a single severe attack of urticaria which subsided, and exactly a month later the adult worm was recovered from an abscess. This case has been free from any filarial manifestation since.

So far it has not been established that urticaria is often a definite manifestation of filarial infection. There seems to have been no reference in the previous literature to the correlation of urticaria to filarial infection. In endemic areas, the occurrence of urticaria is a factor to be recognized although the proportion of these cases is small.

It should be admitted that cases of urticaria due to filarial infection are frequently missed.

This happens because it is usually a very transient condition, preceding an attack of filarial lymphangitis, as shown in cases Nos. 2 and 6 discussed above. Another factor masking the location of urticaria in Indian cases is the pigmentation of the skin. Lastly, since urticarial attacks are produced by several other factors, they have been missed in cases where they should have been definitely ascribed to filarial infection. In this connection it may be pointed out that all the cases discussed above (except Nos. 2 and 6) were admitted into the hospital for various causes and not for filarial infection.

Acton (*loc. cit.*) has shown that giant urticaria is usually the result of sensitiveness to certain foods. The various pressor bases act in two ways: (a) on the involuntary muscular fibres, dilating or constricting the capillaries, and (b) increasing or diminishing the cell permeability of the endothelium. In much the same manner, the urticaria produced in the cases discussed here is due to certain foreign proteins liberated by the adult filariae in the human system. As shown by Acton and Rao (1929a) there is a distinct evidence of the production of a toxin liberated by the adult worm during the process of discharge of embryos. The eosinophilia exhibited by persons with microfilariae in the peripheral blood in contrast with those whose blood is negative for microfilariae is an evidence of the presence of the toxin. The liberation of the toxin therefore, is clearly the cause of the urticaria.

In this connection it is interesting to note that the periodicity of urticaria in the cases discussed throws some light on the embryo-laying habits of *Filaria bancrofti* in the lymphatics. Fairley and Liston (1924) working with *Filaria medinensis* have shown that at the time the worm lays its embryos, there is an occurrence of eosinophile granulation tissue reaction round the worm. The same factor has been observed by the present authors during their studies on "Kataphylaxia in Filariasis" (*loc. cit.*). In the paper referred to, it was shown that there is a distinct eosinophile granulation in the lymphatics in the region of the anterior end of the worm where the vulva is situated, while it is not perceptible in the tail region. This gives further support to the view expressed here that the urticaria is due to the toxin liberated during the discharge of the embryos by the parent worm.

By a proper study of the incidence of the attacks of typical cases of filarial urticaria, it should be possible to obtain a definite knowledge of the life-history of the adult worm in the human system, as to whether embryos laying goes on continuously or whether there is any periodicity.

Not all cases with filarial infection exhibit urticaria. The reason for this is that a hypersensitiveness towards this toxin is developed. The susceptibility of the individual is mainly responsible for this manifestation and affects only



those individuals who are sensitive to this particular toxin, as was shown by Acton and Chopra (1924) in regard to other allergic manifestations.

#### SUMMARY AND CONCLUSIONS.

(1) A detailed study of the correlation of urticaria to filariasis was undertaken.

(2) Seven typical cases of urticaria which were observed during the period are described.

(3) These cases were negative to all the tests used in diagnosing the cause of urticaria, but had microfilariae in their peripheral blood. It is therefore established that urticaria in these cases is due to filarial infection.

(4) The toxin liberated by the adult female worm during embryo-laying is responsible for the manifestation of urticaria.

(5) Urticaria is not seen to be a universal phenomena of filariasis. Individual susceptibility, as in other cases of allergy, evidently accounts for its restricted occurrence.

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#### SOME OBSERVATIONS ON THE INCIDENCE AND MORTALITY FROM ECLAMPSIA IN CALCUTTA, AND ITS PREVENTION.\*

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At the Congress of the Far Eastern Association of Tropical Medicine held at Calcutta in December 1927, a paper was read by Dr. Margaret Balfour, Research Worker at the Haffkine Institute, Bombay, on the diseases of pregnancy, and in it statistics were quoted of the incidence of the various diseases in different parts of India. Figures were obtained from the records of nearly seven thousand cases which were treated in one year at certain hospitals in Bombay, the Government Maternity Hospital, Madras, and the Eden Hospital, Calcutta. Out of this total, 128 cases of eclampsia were recorded, 50 per cent. being from Calcutta with a death rate of 31.2 per cent., as can be seen in the following table:—

Place.	Eclampsia rate per 1,000 births.	Case mortality. Per cent.
Bombay ..	9.7	12.0
Madras ..	13.3	12.8
Calcutta ..	41.0	31.2

\* Being a paper read at the Medical and Veterinary Section of the Indian Science Congress, Allahabad, January, 1930.

Even allowing for the fact that Madrassi women are probably more ready to go to hospital for a normal confinement than those in Bengal, these figures show that there is a very high incidence and a severe type of the disease in Calcutta, the reason for which has still to be investigated. Apart from the actual eclamptic fits, many cases of toxæmia of a lesser degree occur, these being so common that the popular opinion among the women is that œdema and malaise are part of normal pregnancy and so can be disregarded and given no treatment—hence the most disastrous results frequently ensue.

Recently a closer investigation of all the eclampsia cases which were treated at the Lady Dufferin Victoria Hospital, Calcutta, during the years 1927 and 1928 was made. The incidence was found to be rather higher than in the neighbouring Eden Hospital, for 65 cases were seen in that time out of a total of about 1,200 deliveries. Apart from this, certain striking facts emerged:—

(1) That a very large majority of the cases were primigravidae.

(2) That it was mainly a disease of young women of 20 years of age or under.

(3) That the death rate among these younger women was double that among the older ones.

The following tables illustrate this:—

Parity.	Number of patients.	Deaths.	Percentage of mortality.
Primigravidae	53, i.e., 81.5%	11 (plus† 2)	24.5 (20.75)
Multigravidae	12, i.e., 18.5%	2	16.6 %

† Two cases taken home almost moribund.

Age of patient.	Numbers.	Number of deaths.
14 years	2	0
15 "	8	2
16 "	10	3
17 "	6	3
18 "	5	0 (plus 1)
19 "	6	1
20 "	13	2 (plus 1)
21 "	0	0
22 "	2	0
23 "	1	0
24 "	2	0
25 "	4	1
26 "	1	0
27 "	0	0
28 "	1	1
30 "	2	0
32 "	2	0

Another fact that was brought out by the study of this series of cases was that the prognosis was far more serious when fits occurred in the latter

months of pregnancy than when they began with ordinary labour. The figures are as follows:—

Times of onset with reference to labour.	Number of cases.	Deaths.	Percentage death rate.
Before labour ...	15	6 (plus 1)	47 % (40 )
With or during labour.	45	6 (plus 1)	15.5% (13.3)
After labour ..	5	1	20 %

The number of cases in the last line are too small to be of great significance. It was further noted that out of 16 cases who came in for labour and developed eclampsia in hospital, only one died and that was after 6 post-partum fits.

*Promonitory symptoms* occurred in at least three-quarters of the cases, especially cedema and headache, the former in 33 and the latter in 27 of the series, but headache was very often a very late symptom and came on in 11 of the cases only a few hours before the commencement of the fits. In 12 others it had been complained of at times varying from one week to two months previously. The cedema was more often of long duration, having lasted from one to four months in more than half the patients and in two cases throughout pregnancy, while in 13 others it had been present less than 14 days. Other prodromal symptoms were of comparative rarity, for a history of vomiting was given only in four cases; scanty urine, fever and frequent stools each in two; and drowsiness, stupor, loss of appetite, poor sight, abdominal pain and marked constipation each in one instance.

Symptoms lasting over a week had been present in about half the cases and yet there was no evidence that treatment had been received by any of these patients.

*Preventive measures.*—In the light of the above figures, surely it is time that the subject should be more seriously considered by the medical profession and the health authorities in this country. We know that the disease can largely be prevented by ante-natal care, so much so that in those countries where ante-natal clinics are properly and widely organized and medical advice is sought regularly by the majority of pregnant women, eclampsia is rapidly becoming an uncommon disease. The lives lost here in India are those of otherwise healthy young women, over whose recent marriage a large amount of wealth has been spent. If general practitioners would combine together, especially in the districts where the disease is most common, and give warning to the heads of all households which they attend and where there are young married women, of the possibility of the disease, and the need for constant medical supervision and dieting during pregnancy, especially for the last three months, then the disease would become much less frequent. For the poor who cannot afford to call a doctor often or to pay for frequent testing of the urine for albumen, systematic house-to-

house visiting should be instituted by municipal health visitors, midwives or voluntary social workers, and the pregnant women encouraged to attend one of the free ante-natal clinics now attached to women's hospitals and maternity homes or welfare centres, and there they would have thorough examination and receive advice should the least deviation from normal be detected at any time.

It is ignorance that is largely responsible for the existing state of affairs, and households who have once experienced one of these tragedies in their midst, will soon respond to promises of help on future occasions, even if it does mean breaking down many old customs; and others will follow once the lead is given. At the British Medical Association Annual Meeting held at Manchester in July 1929, the suggestion was brought forward by an obstetrician from one of the leading London hospitals that the toxins responsible for this disease, could be prevented from developing or neutralized as they were formed, if sufficient alkalies were regularly given from as early as the second or third month of pregnancy to keep the body tissues at a certain degree of alkalinity, the degree being checked by laboratory tests on the blood and urine. He had treated a series of patients who had suffered from eclampsia or lesser toxæmia during the previous pregnancy on these lines, as well as by careful dieting, and though as much as an ounce and a half of alkali in the form of potassium citrate and sodium bicarbonate might be required daily yet he had had very favourable results both to the mothers and to the infants. His number of cases was small, but considering the great damage that the disease is responsible for in this country, it would be worth while trying the experiment on a larger scale, even if conditions were such that the amount of alkali required could not often be checked by laboratory tests.

From a social standpoint, the fact that it is the young primigravidae who suffer most from this toxæmia could be used as a strong argument in favour of raising the marriage age and the time of consummation of marriage until the girl has completed her physical growth, for in the year November 1927-1928, out of the 34 girls of sixteen years and under who were admitted to the Calcutta Dufferin Hospital for their first confinement, no less than 11, i.e., 32 per cent. had eclampsia, to say nothing of those who had lesser signs of toxæmia.

## THE EFFECT OF SANOCRY SIN ON THE EFFICIENCY OF THE LIVER.

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It is now agreed that the toxic symptoms produced by sanocrysin in tuberculous patients

are not due to cleavage products of the tubercle bacillus, but are the result of metallic poisoning. The fact that metallic compounds are taken up by the liver and retained for a considerable period (Rolleston and McNee, 1929), raises the question as to whether this drug interferes with hepatic function. It has been shown that intravenous administration of colloidal preparations of lead produces focal necrosis of the liver (Cunningham and Datnow, 1929), and that large subcutaneous doses of aluminium cause hepatic injury (Underhill *et al.*, 1929). Cushny (1924) states that nausea, vomiting and diarrhoea, persisting for several days, follow the intravenous injection of large doses of the double chloride of gold and sodium in dogs. The animals eat nothing, lose weight, and die in a week or more after the injection, ulcers are found post-mortem in the stomach and intestines. This author does not mention the occurrence of lesions in the liver. That sanocrysin damages the cells of the kidney is shown by the fact that albuminuria occasionally follows its administration. The observations of Sevend Lomholt (1926) led him to the conclusion that sanocrysin "produces toxic effects in the organism which are not unlike those caused by other heavy metals, and that there is therefore the same danger of poisoning through accumulation of the metal."

In five patients (Table I), suffering from chronic pulmonary tuberculosis the ordinary lævulose tolerance test was done  $\frac{1}{2}$  to 1 hour after the intravenous administration of sanocrysin in

doses varying from 0.05 gm. to 0.5 gm., a control test having been carried out in each case on the previous day. One of the patients had already been on sanocrysin treatment, but this had been stopped some weeks before the test. Estimations of the bilirubin content of the blood serum were also made two hours after giving sanocrysin, as well as on the day before. In six cases (Table II), suffering from diseases other than tuberculosis, the effect of 0.1 gm. of sanocrysin on the ability to store 50 grms. of glucose was similarly observed. The sugar was given before the morning meal immediately after the drug. In a third series of six patients (Table III), two of whom (Nos. 1 and 6) were tuberculous, the blood sugar was estimated at half-hourly intervals up to  $2\frac{1}{2}$  hours after the intravenous injection of 0.1 gm. of sanocrysin. No carbohydrate was administered, the object being to see whether the gold preparation interfered with the maintenance of the blood sugar level by the liver. In none of the subjects experimented on were vomiting or diarrhoea produced. Albuminuria occurred in one patient and a rise of temperature in two.

Most of the cases had high initial blood sugar and from the results in Table II it is probable that a large proportion had defective power to store glucose. Nevertheless, the glucose and lævulose curves after sanocrysin were no worse than in the control experiments. In some instances there was actually an improvement in carbohydrate tolerance. Further, the figures in

TABLE I.

Blood sugar in mgrms. per 100 c.c. at half-hourly intervals after ingestion of 50 grms. of lævulose in 150 c.c. of water. (a) Controls. (b)  $\frac{1}{2}$  to 1 hour after sanocrysin intravenously.

		Initial.	$\frac{1}{2}$ hour.	1 hour.	$1\frac{1}{2}$ hour.	2 hours.	Maximum rise.	Serum bilirubin in units.
(1) S. S., æt 35	Chronic bilateral pulmonary tuberculosis. Afebrile. Rise of temperature to $99.4^{\circ}$ . After sanocrysin. Dose 0.5 gm.	(a) 109	201	166	116	164	17	Trace.
		(b) 201	202	181	176	169	1	Trace.
(2) M. S., æt 28	Bilateral pulmonary tuberculosis. Irregular temperature. Fever ( $102^{\circ}$ ) after sanocrysin. Dose 0.25 gm.	(a) 156	181	168	147	149	25	Trace.
		(b) 155	185	150	147	152	30	Trace.
(3) A. M., æt 33	Bilateral pulmonary tuberculosis. Daily rise of temperature to about $100^{\circ}$ . Albuminuria after sanocrysin. Dose 0.05 gm.	(a) 134	153	150	136	140	19	0.65
		(b) 122	137	130	104	102	15	0.70
(4) A. A., æt 36	Bilateral pulmonary tuberculosis. Febrile ( $99-100^{\circ}$ ). No reaction after sanocrysin. Dose 0.1 gm.	(a) 139	143	160	149	146	21	0.43
		(b) 115	120	122	143	141	28	0.43
(5) B. K., æt 30	Unilateral pulmonary tuberculosis with pleural effusion. Afebrile. Spleen palpable. No reaction after sanocrysin. Dose 0.1 gm.	(a) 115	135	136	125	120	21	0.57
		(b) 115	125	111	119	115	10	0.66

TABLE II.

Blood sugar in mgrms. per 100 c.c. at half-hourly intervals after ingestion of 50 grms. of glucose in 250 c.c. of water. (a) Controls, (b) immediately after 0.1 gm. sanocrysin intravenously.

		Initial.	$\frac{1}{2}$ hour.	1 hour.	$1\frac{1}{2}$ hour.	2 hours.	$2\frac{1}{2}$ hours.
(1) G. N. K., æt 33..	Chronic gonorrhœa.	(a) 123 (b) 122	190 155	196 181	148 133	134 111	.. 95
(2) N. A., æt 25 ..	Convalescent from lobar pneumonia. Spleen 2 inches below costal margin.	(a) 152	196	205	181	155	149
(3) S., æt 55 ..	Emphysema. Spleen 3 inches below costal margin.	(b) 150 (a) 159	168 234	211 271	146 286	111 299	139 266
(4) A. R., æt 29 ..	Local sepsis	(b) 152 (a) 171	218 257	254 291	254 216	234 182	189 137
(5) A., æt 20 ..	Chronic malaria. Palpable spleen.	(a) 156 (b) 154	245 215	279 210	231 241	191 196	177 177
(6) V., æt 30 ..	Convalescent from enteric. Roundworm infection.	(b) 166 (a) 162	216 206	251 206	221 ..	182 191	181 157
		(b) 179	196	187	196	193	196

TABLE III.

Fasting blood sugar at half-hourly intervals after 0.1 gm. sanocrysin intravenously.

		Initial.	$\frac{1}{2}$ hour.	1 hour.	$1\frac{1}{2}$ hour.	2 hours.	$2\frac{1}{2}$ hours.
(1) M. S., æt 30 ..	Tuberculous pleurisy ..	137	137	135	127	117	122
(2) R. B., æt 35 ..	Ankylostomiasis ..	146	137	118	125	126	131
(3) S. S., æt 20 ..	Chronic malaria ..	141	143	141	133	139	..
(4) E. S., æt 20 ..	Convalescent from broncho-pneumonia.	156	139	159	139	159	141
(5) H. R., æt 50 ..	Syphilis ..	156	156	171	166	150	156
(6) W. S., æt 22 ..	Unilateral pulmonary tuberculosis. Febrile, temperature 99° daily.	150	152	166	159	177	177

Table III do not indicate any marked constant effect of sanocrysin on the fasting blood-sugar level. One may, therefore, conclude that this preparation did not exert any deleterious effect on the glycogenic function of the liver in these patients. The ability of the liver to excrete bile pigment would also seem not to have been disturbed in the patients in Group I. The observations do not, of course, prove that there is no hepatic derangement when vomiting and other gastro-intestinal symptoms follow sanocrysin administration, but they show that interference with the liver function does not generally result from the administration of small doses of this drug.

#### CONCLUSION.

Sanocrysin administered intravenously in doses varying from 0.05 gm. to 0.5 gm. was found not to damage the glycogenic function of the liver in 17 patients, 6 of whom were suffering from pulmonary tuberculosis. In five of the latter the bilirubin content of the blood serum was estimated 24 hours before and 2 hours after

giving the drug. No significant change was observed in any of the patients.

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\* Seen in abstract.

## THE VALUE OF PHRENIC-EXAIRESIS IN THE TREATMENT OF PULMONARY TUBERCULOSIS.\*

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*History of the operation.*—In 1911 Stuertz suggested phrenectomy as an operation to be used in the treatment of pulmonary tuberculosis, but at that time this operation attracted only little attention. Since 1922 when Goetze and Felix reported encouraging results after evulsion of the nerve, the phrenic-exairesis operation has gained much ground all over the world, especially during the last few years.

The reason why a simple cutting of the phrenic nerve often has no permanent effect, was shown by Felix to be due to the existence, in from 25 to 30 per cent. of cases, of an accessory phrenic nerve which is not destroyed by the mere cutting of the main nerve. Later researches by other authors have supported the work of Felix. By anatomical studies on 17 cadavers Ruhemann(1) found the accessory nerve to be regularly present, and Plenck and Matson(2) found this "nebcuphrenicus" in 29 out of 48 cases studied. In 1925 Yano(3) found the accessory branch present in 17 out of 22 bodies, and Kutamanoff(4) found that the nerve was double in 69 cases out of 100 anatomical preparations examined by him. Besides the accessory phrenic nerve, there exist also subclavicular and sympathetic anastomoses. Morriston Davies(6) describes a summary of abnormalities observed by him during operations. A more radical procedure than a simple cutting of the main nerve was therefore found to be necessary in order to destroy the accessory branch and the possible anastomoses. The first evulsion of the nerve, by which this destruction is obtained, was performed by Felix(6), the operation being suggested by Thiersch.

*The physiological effect.*—The effect of the phrenic exairesis operation is that the paralyzed hemidiaphragm occupies a higher position in the thorax. The elevation may be on the right side from 4 to 8 cm. and on the left from 2 to 4 cm.(6). The rise is increased during the ensuing weeks. Goetze(7) states that the paralyzed diaphragm may continue to rise for six months. This should be borne in mind, as it is one of the reasons why the full benefit of phrenic-exairesis is often seen only after several months.

During ordinary respiration the paralyzed dome of the diaphragm remains immobile. By the high and immobile position of the hemidiaphragm the lung volume is said, in favourable cases, to be reduced, not infrequently, by one-quarter to

one-third. The result of this reduction is a partial collapse of the lower lobe and a diminished respiratory activity, especially at the base. The operation has the effect of partly immobilizing the lung, and phrenic-exairesis produces therefore an effect similar to that produced by artificial pneumothorax, although to a less degree.

*The technique.*—Under local anaesthesia usually with 10 c.c. of a half per cent. solution of novocain with adrenalin, an incision of from one to two inches in length is made from the middle of the posterior border of the sterno-mastoid muscle to the middle of the clavicle. The phrenic nerve is found on the scalenus anticus muscle beneath the fascia, traversing this muscle from without inward and downward entering the thorax behind the subclavian vein. When the nerve has been dissected totally free, it is divided and slow traction is applied on the peripheral end, by which procedure the nerve is gradually pulled out of the thorax. The patients often feel some pain over the epigastrium or occasionally in the shoulder when the evulsion is performed.

Although the operation is a comparatively minor one, it is not without risk. Severe hæmorrhages have been described to occur by cutting of veins with the subsequent danger of air embolism. In one of our cases the jugular vein was mistaken for the scalenus muscle and opened. The same mistake is also reported by Gravesen(8) in which case air was sucked in. The vein was, however, in both cases ligatured and no symptoms of air embolism were observed. Morriston Davies(6) mentions four occasions where the vagus nerve has been mistaken for the phrenic, with fatal results each time. He draws attention to the possibility that the traction on the nerve trunk may lead to rupture of the pleura or of the lung if the pleura is attached to the surface of it. Such a rupture of pleura occurred in one of our cases with a fatal result. This was due to the collapse of the lung in the side operated upon by a sudden rush of the air through the ruptured pleura, while the other lung was already collapsed by pneumothorax treatment with recent refill, and in this way both lungs became collapsed at the same time. Temporary heart failures, dyspnœa, and hæmoptysis are mentioned as operative complications, but we have not experienced any of these. Copious vomiting and severe shivering just after the operation have occurred in a few of our cases.

The length of the nerve secured by the evulsion seems to be of less consequence. We have observed some of the best results of the operation in cases where only one inch of the nerve was removed, while in some cases no benefit was obtained where even 13 inches, or practically the whole peripheral end of the nerve was pulled out.

The first 76 phrenic-exairesis operations at the sanatorium were performed by Dr. R. H. H. Goheen and the last 28 by Drs. P. V. Benjamin and David V. Gnanamuthu.

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*Indications.*—The phrenic-exaïresis operation was originally performed chiefly as a preparatory operation to thoracoplasty, with the object of testing the ability of the other lung to stand the strain of the increased respiratory work to be borne by it, or with the object of giving the patient an opportunity of readjusting himself to the changes in the circulation and respiration resulting from the sudden collapse of one lung after thoracoplasty. During last year phrenic-exaïresis has, however, gained much ground as a substitute for pneumothorax treatment in cases where either pleural adhesions are preventing this treatment, or where it is contra-indicated on account of too extensive lesions in the less diseased lung. Generally speaking it can be said that the indications for phrenic-exaïresis are the same as for pneumothorax treatment, although the indications can be extended also to cases unfit for pneumothorax treatment where, for some reason or other, thoracoplasty is not advisable.

Several authors have argued that phrenic-exaïresis should be used as a substitute for pneumothorax treatment only in those cases where the lesion is confined to the basal part of the lung, as the paralysis of the hemidiaphragm could not have any effect on lesions in the apex of the lung. Holmbo(9) declares this argument to be purely theoretical and not substantiated by clinical experience, as good results have been obtained in cases with apical lesions, while bad results have been observed in cases with basal lesions. Morriston Davies(5) states that experience has shown that the upper part of the lung is unquestionably affected in certain cases. This was demonstrated by x-rays showing diminution in cavities near the apex following immediately on phrenic evulsion. He quotes a number of well-known authorities who all emphasize this point, and he gives his own experience in support of it, to which we can also add ours.

There has been a considerable controversy on the question of the use of the phrenic-exaïresis operation as an accessory to pneumothorax treatment in order to supplement an incomplete pneumothorax. Gravesen(10) expresses himself strongly against this use of phrenic-exaïresis, having obtained chiefly negative results, and argues that the paralyzed diaphragm will give way to positive intrapleural pressure and in this way prevent a proper collapse being established. Morriston Davies(5), however, draws attention to a statement by Zadek in which it is pointed out that the paralyzed dome prevents the downward displacement of hemidiaphragma unless excessive intrapleural pressures are used in collapsing the lung by the pneumothorax. The experience of Morriston Davies is that good results from phrenic-exaïresis were often obtained in cases of incomplete pneumothorax. The intervals between the refills were lengthened considerably, and he states that "excellent results" were seen in some cases, while other cases were "considerably benefited."

We share the experience of those who report that good results are obtained by phrenic-exaïresis as a supplement to pneumothorax treatment. In one case where the fever and the presence of tubercle bacilli in the sputum persisted after eleven refills, the fever disappeared two weeks after the phrenic-exaïresis operation, and the bacilli three months later; cough and sputum soon became less, the weight increased and the lung improved considerably. The patient, after twenty-five more refills, was discharged as "much improved." In two other cases a similar striking improvement was observed, while marked improvement was obtained in about half the number of cases where phrenic-exaïresis was used as an accessory to pneumothorax.

In India where it is so difficult for patients to continue pneumothorax outside the few places where this treatment is given, the phrenic-exaïresis operation should be used also in many cases with a complete pneumothorax when the patient has to leave without prospect of receiving further refills. The phrenic-exaïresis operation will produce a permanent minor collapse preventing the lung from a too sudden and a too extensive re-expansion.

The opinion of a few authors that phrenic-exaïresis should be done practically in all cases treated with pneumothorax is not shared by a great number of authorities. In this connection it should be pointed out that during a complete pneumothorax the lung can be allowed to re-expand if the other lung shows signs of becoming extensively attacked, while a collapse produced by phrenic-exaïresis is permanent. We have observed two cases where this permanent collapse proved very detrimental as the lesion in the other lung increased in activity.

*Analysis of our results.*—At the sanatorium 104 patients have been operated on. From the analysis are excluded 4 cases operated on in connection with thoracoplasty, and 8 cases in which the time since the phrenic-exaïresis has been less than one month.

Out of 92 cases left for analysis 1 was in the I stage, 7 were in the II stage and 84 in the III stage of pulmonary tuberculosis. The patients are divided into group A, comprising those on whom the operation was performed as accessory to pneumothorax-treatment, and group B, comprising those on whom it was done as the sole procedure.

A. Thirty-seven patients who did not derive the full benefit of pneumothorax treatment due to adhesions present were operated upon after having received from 10 to 35 refills. Of these patients one was in stage II C, 5 in III A, 10 in III B, and 21 in III C.

Fever disappeared within from one to six weeks after the phrenic-exaïresis operation in 11 patients out of 24 of this group who had fever at the time of operation. Among 8 patients out of 15, who later on became "much improved,"



the fever present before the operation disappeared in 7 out of the 8 cases, within six weeks.

*Tubercle bacilli* disappeared from the sputum within about 6 weeks after the operation in 14 out of 31 cases having tubercle bacilli in sputum at the time of operation.

*Cough and sputum* became less after the operation in 12 out of the 37 cases, and *the weight* increased in 4 cases while the weight was decreased only in one case in this group.

*End results.*—Out of the 5 cases in stage III A, 2 were "much improved" and 2 "improved"; out of the 10 in III B, 5 were "much improved" and 4 "improved"; and out of the 21 in III C, that is in the stage with the worst prognosis, 8 or 38 per cent. were "much improved" and 5 "improved."

B. Fifty-five patients had the operation as the sole procedure. Out of these one was in stage I, 6 in stage II, 7 in III A, 13 in III B, and 28 in III C.

*Fever* disappeared within from one to six weeks after the operation in 12 out of 39 cases which had fever at the time of operation. In 8 out of 19 which later on became "much improved," the fever disappeared in 7 out of the 8 cases.

*Tubercle bacilli* disappeared from the sputum within about 6 weeks after the operation in 12 out of 51 cases having tubercle bacilli in the sputum at the time of operation.

*Cough and sputum* became less after the operation in 28 out of the 55 cases, and *the weight* increased in 12 cases, while it decreased in 19.

*End results.*—The one patient in stage I and the 3 out of 6 in stage II were "much improved." Out of the 7 patients in III A, 4 were "much improved" and 1 "improved"; out of the 13 in III B, 5 were "much improved" and 4 "improved"; and out of 28 in III C, 6 or 21.4 per cent. were "much improved," and 7 "improved."

We have not observed any difference worth mentioning in the results obtained in the patients having the operation on the right side compared with those having it on the left.

#### CONCLUSIONS.

Our experience is that the phrenic-exaeresis operation is of value in the treatment of selected cases of advanced pulmonary tuberculosis, both in those cases where the operation is performed as an accessory to an incomplete pneumothorax, and also in those cases where the phrenic-exaeresis is the sole procedure. In India where pneumothorax treatment is so difficult to continue when the patients have to leave the few places where it is given, the phrenic-exaeresis should be performed also in cases with a complete pneumothorax at the time the pneumothorax treatment is stopped earlier than desired, in order to prevent a too sudden and a too extensive re-expansion of the collapsed lung.

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#### SOME SURGICAL ASPECTS OF TUBERCULOSIS.\*

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AN eminent authority on tuberculosis, Sir R. W. Philip wrote a few years ago, "The more one sees of tuberculosis, and the distressing aftermath of operative interference, the more one is constrained to advise the surgeon to withhold his hand" (1). Now no doubt there may be complicated cases, with diffuse or varied forms of infection. Incomplete surgical operations can at best only result in local palliation. Perhaps physicians see many cases complicated by general infection, including some in which surgeons have failed to give relief, or have attempted too much. But even in the treatment of pulmonary tuberculosis great advances have been made. Diagnosis has been greatly facilitated by the use of x-rays, bronchoscopy and the use of iodized oil. It is only necessary to mention the excellent results obtained by artificial pneumothorax, resection of ribs for empyema, thoracoplasty for chronic pulmonary phthisis and partial pneumonectomy (2). Still even now, in the presence of acute phthisis, surgery is almost powerless.

In glandular tuberculosis the case however is very different. In the plains of India, bovine tuberculosis is relatively uncommon, only about 3 per cent. of the slaughtered cattle showing traces of it. But there the herds live an open air life. In Kashmir, with its intensely cold winter, necessitating the shutting up of cows in sheds, which are too often absolutely without ventilation, bovine tuberculosis is more common,

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and this accounts for the number of cases with which we have to deal.

In 1901 we published a record of 700 cases of tuberculous glands,(3) and since then the total has mounted up to 3,000 operations for this condition.

There must be some difference between the type which we see and that met with in Europe. The Berne Hospital Reports record a death rate of 29 per cent. in 692 cases, the lungs, intestines, meninges or kidneys being subsequently affected(4). With us the post-operative mortality has been very low, under 0.5 per cent., debility, tuberculous meningitis and tuberculous ulceration of the bowel being the chief causes. Until recently, the absence of associated pulmonary disease was remarkable. Now, occasionally, we do meet with it. In 1923, curiously enough, in one month, we had two cases in which there was slight hæmoptysis, some days after operation, respectively for tuberculous glands of the neck, and ankle joint disease. Such cases, which are rare, do not necessarily invalidate the belief that in Kashmir, phthisis pulmonalis and tuberculosis of lymph-nodes are usually due to different types of infection; for separate lung infection might have been activated by disturbance of bovine foci at the time of operation. During the first twenty years that I practised in the Valley of Kashmir, its extraordinary freedom from pulmonary tuberculosis was a constant source of surprise. In those days, especially from 1880-90 communications with India were not easy, and the difficulties were sufficient to stop invalids from using Kashmir as a health resort. Now this is all changed by motor traffic, and every year many phthisical patients are sent here for the benefit of the climate.

There can be no doubt that many cases of tuberculous lymph glands are strictly localised and can be eradicated surgically. In Kashmir, wounds of fingers and toes with creeping tuberculous infection of lymph-glands are not uncommon and such cases call imperatively for early excision. This is usually followed by complete recovery. So also infection may break through the first line of defence—the tonsils and adenoid tissue(5). Indeed our experience here leads us to think that infection of lymph-nodes is due to local and not to blood transmission. Thus prompt surgical operation is usually followed by recovery. This does not mean that very early cases should not be dealt with medically, while being kept under observation. Sir Robert Philip lays great stress on the importance of watching children, especially in families with a tuberculous history. Anticipatory detuberculization by the percutaneous method is important and even if glandular enlargements are present, they may be progressively reduced. Heliotherapy is most valuable. Sir Henry Gauvain's work in demonstrating the amenability of surgical tuberculosis to wise treatment under favourable conditions

and if sufficient time is available is well known. But the danger, of course, is lest patients should not remain under observation, or lest they should have insufficient patience and resort to other treatment while the glands continue to increase in size. Creeping infection may thus involve fresh areas, so that patients may return with masses of enlarged glands, for instance, on both sides of the neck, and even in the axillæ. Some of these nodes may have softened and suppurated. There may even be induration, and sinuses with septic discharge and much resulting deformity. Operative treatment may then be extremely difficult, even if advisable.

For this reason conservative treatment must be used with caution and at once abandoned if there is evidence of progression or softening. I remember a case, many years ago in which operation, for some reason was deferred although a lymph-node in the neck was soft and fluctuating. The patient suddenly developed acute phthisis. At the same time the node diminished in size and there was grave doubt as to whether a rupture into the cellular tissue may not have started or activated the disease. This case, which was in England, may however not have been of bovine origin. The exact pathology of these glands is still not quite clear. It seems probable that the majority are due to bovine infection. Certainly the danger from unboiled milk of tuberculous cows must be very real. It is disquieting to be told that one quarter of the specimens of milk examined in London were tainted with the tubercle bacillus(6). What must be the condition in Kashmir?

As a matter of fact, most of the cases of enlarged lymph nodes which come to us for treatment are already so advanced as to leave no doubt as to the wisdom of their immediate removal. Early cases, before the softening of the glands has proceeded too far, are very easy to deal with. I have removed as many as 58 from one patient, and if not adherent and not mere bags of pus they may shell out almost like potatoes. On the other hand soft adherent glands, especially if embedded in firm adhesions or adherent to main vessels entail tedious dissection and prolonged operation. Indeed sometimes, although not an ideal method, recourse must be had to evisceration. The indications for this are very superficial glands suppurating and with thin adherent skin over them, or on the other hand deep adherent soft glands especially if in close contact with main vessels. The careful use of a sharp spoon and iodoform emulsion often gives very satisfactory results. Even in cases where septic sinuses lead to disintegrating gland masses, it is nevertheless sometimes possible to excise the whole and this should always be one's aim. With regard to operative technique, it is sufficient to say that incisions should give free access and not leave scars in conspicuous positions. The spinal accessory nerve should be sought and spared and branches of the cervical plexus left intact as far

as possible. With care the internal jugular vein is seldom in danger, but small branches cut near the main trunk may give trouble. Nodes under the sterno-mastoid attacked from the posterior triangle may be adherent and in traction upon them the danger of wounding a displaced internal jugular vein must be remembered. There is one other point, and that is that only obviously diseased glands should be removed. It is undesirable to deprive the lymph circulation of valuable gland filters if they are still working.

It is difficult to obtain accurate results, but on a conservative estimate 75 per cent. of our 3,000 cases were cured although some of these, possibly 10 per cent., might need further operations for other glands. Some 15 per cent. were distinctly improved but had slight discharge or incomplete removal of all diseased glands. About 10 per cent. left hospital with discharging sinuses and other signs of tuberculous disease and 0.5 per cent. died after operation in hospital. Such results encourage the surgeon not to "withhold his hand."

Tuberculous bone and joint surgery also hardly needs holding of a brief on its behalf. Especially during the past quarter of a century have the results shown manifest improvement. It is true that in the East there are still too many instances of cases first coming to the surgeon when there are already one or more sinuses communicating with a septic joint. In the case of the ankle, it is seldom that the necessity for a Syme's amputation can be avoided. This is also the case with regard to tarsal disease, where the bones are often so soft and fatty that operations for caries are usually doomed to failure. An exception perhaps is the os calcis which can sometimes be removed with success. In septic tuberculous disease of the elbow, excision still holds its own. In the knee arthrectomy if done early saves many a limb. My practice is to save the crucial ligaments, removing all accessible synovial membrane and treating the rest with a sharp spoon, and friction with a swab carrying iodoform emulsion.

In the case of early joint disease, exposure to the sun's rays and the careful use of tuberculin gives excellent results if time is available. But with hospital patients early arthrotomy, followed if there is no marked improvement, by arthrectomy saves an immense amount of time and gives results which are more rapid and usually equally good.

In the case of joints, bones and abscesses, the value of early evacuation of pus, closure of the wound, and rest with heliotherapy and the use of well-known auxiliaries, e.g., tuberculin, Bier's bandage, cupping, etc., has been demonstrated, and the results of present day surgical treatment in tuberculous adenitis, bone and joint disease and cold abscesses are therefore in gratifying and in marked contrast to the conditions which existed even at the beginning of this century.

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### THE SIGNIFICANCE OF SPIROCHÆTES IN THE SPUTUM, WITH SPECIAL REFERENCE TO PULMONARY TUBERCULOSIS.\*

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*Historical summary.*—A good deal has been written in recent years about bronchial and broncho-pulmonary spirochætos. As early as 1867 Leyden and Jaffe(1) discovered spirochætes in the sputum in cases of putrid bronchitis, and also at necropsy in gangrenous lung tissue. In 1905 Rona(2) reported the presence of spirochætes in two cases of pulmonary gangrene. But it is only since Castellani's(3) claim in 1906 of the discovery of a new tropical disease, which he called "broncho-spirochætos," that extensive investigations have been made on this subject. Since then, reports of cases from all parts of the world have appeared, including those by Waters(4) from India, Lesslar and Kanagarayer(5) from Malaya, Sinclair(6) from the Philippines, Schwarz(7) from Egypt, Violle(8) from the Continent, Campbell Faill(9) from England, and Smith(10), Pilot(11) and co-workers from the U. S. A., showing that "broncho-spirochætos" is not a "tropical" disease.

The impression one gets from the different reports about the morphology of the *Spirochæta bronchialis* and the nature of the disease caused by that organism is rather confusing.

According to Castellani(12), the spirochæte is extremely pleomorphic, its length varying from 3 to 30 microns, its breadth from 0.2 to 0.6 microns. The number of coils also varies from 3 to 10. As Knowles(13) rightly puts it, "Castellani's original description of *S. bronchialis* is such that it would be almost impossible to recognize this 'species' even if one came across it." Fantham(14), who has studied the

\* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad, January, 1930.

morphology of this organism, supports Castellani's findings, and considers that this spirochæte is different from the ordinary ones found in the mouth. On the other hand Smith (10), Vincent (15), Schwarz (7) and Mühlens (16), among others, hold the view that the so-called *Spirochæta bronchialis*, is in reality, one of the ordinary spirochætes found in the mouth. According to Smith (17), the spirochætes and fusiform bacilli grown in culture, from the lung tissue of those who had died of spirochætal disease of the lungs, were morphologically identical with those found in the mouth. Bezançon and Etchegoin (18) take still a third position. They think that the spirochæte that causes blood in the sputum is neither the *Spirochæta bronchialis* of Castellani, nor one of the mouth spirochætes as others claim, but is one that is morphologically intermediary between the two.

This confusion of findings is probably due to the fact that the differentiation of the spirochætes found in the sputum from those found in the mouth is very difficult. It has to be remembered that fusiform bacilli are always found in association with spirochætes of the mouth, and when spirochætes are found in sputum, the fusiform bacilli are also nearly always present. The consensus of opinion to-day, as Baldwin (19) and his co-workers point out is that the spirochætes that produce broncho-pulmonary diseases, are mostly those found in the mouth, namely, *Treponema microdentium*, *Treponema macrodentium*, and *Spirochæta vincenti*, and not a different organism as is claimed by Castellani and others.

Castellani's (12) own description of the disease "broncho-spirochætosis" is extremely vague. Since his publication in 1906 numerous observers have reported on the subject and have claimed the spirochætal infection as the cause, or as one of the causes of a great variety of broncho-pulmonary disorders, such as hæmoptysis in pulmonary tuberculosis, secondary mixed infection in tuberculous cavities of the lungs, bronchitis, certain cases of unresolved pneumonia, bronchiectasis, lung abscess, and lung gangrene.

This question regarding the significance of spirochætal infection in relation to most of the conditions mentioned above has been re-investigated among the patients in the Sanatorium.

**Technique.**—The examination of the sputum for spirochætes is influenced by the fact that spirochætes in association with fusiform bacilli are normally present in the mouth. They were found by Pilot and Davis (11) in 82 per cent. of tonsils, and 32 per cent. of adenoids. In 100 of our patients in the Sanatorium whose gums and tonsils were examined for spirochætes and fusiform bacilli, these organisms were found in 93 per cent. of gums, and in 34 per cent. of tonsils. It is therefore important to avoid contamination from the mouth when examining the sputum for spirochætes and fusiform bacilli. To this end the mouth should be rinsed out as pointed out by several of the later investigators; and the throat gargled several times with a sterile mouth

wash, just before the collection of the specimen. Care should, in our opinion, be taken to see that the sputum is really coughed up from the chest, and expectorated immediately into a sterile Petri dish. When there is difficulty in bringing up the sputum from the chest by cough, there is a common tendency to clear the throat, and bring out the secretion from the posterior nares. Should the patient fail to cough up sputum from the lungs but bring out mucus from the posterior nares, care should be taken to rinse the mouth again, before another attempt is made to bring up the sputum.

When the sputum has been brought up in the proper way, a piece of the thick sputum about the size of a bean should be separated and washed at least five or six times with sterile normal saline as suggested by Smith (10). From the centre of this piece a small portion should be taken for smears. The smears should be made within half an hour after taking the sputum as it is stated that spirochætes disappear from sputum if kept too long. The smears should be dried in air, and fixed by Ringer's solution, not by heating. In our investigation the smears had been stained by both Fontana's stain and gentian violet, the latter chiefly used, since it is easier and as reliable as the former.

*The presence of spirochætes in washed sputum.*

—The sputum of 331 patients in the Sanatorium has been examined without previous washing of the mouth and the sputum, and spirochætes were found in 196 or 59.2 per cent. On the other hand in the sputum of 170 patients examined after previous washing of the mouth and the sputum, spirochætes were found in only 3 or 1.8 per cent.

In the reports of some of the early workers, it has not been stated whether the precautions mentioned above in collecting the sputum have been taken or not. From the results given here it will be easily understood that those investigations in which these precautions were not taken are of no value whatever regarding the whole question of spirochætes in the sputum.

*Spirochætal infection and hæmoptysis in pulmonary tuberculosis.*—Sinclair (6) in the Philippines has examined the sputum of 410 cases of pulmonary tuberculosis for spirochætes and found these organisms in 256 or 62.4 per cent. He does not say whether any precautions were taken to avoid mouth contamination. It is significant that his percentage of positives closely corresponds to the percentage of 59.2 in the 331 tubercular patients examined by us without due precautions against mouth contamination. In 238 cases with hæmoptysis he found spirochætes in 182 or 76 per cent., and he concludes from this that the spirochæte is an important cause of hæmoptysis in pulmonary tuberculosis. Bezançon and Etchegoin (20) have found spirochætes in 43 out of 46 cases of hæmoptysis in pulmonary tuberculosis and they conclude that spirochætes are of clinical significance in tuberculous hæmoptysis.

Among the 170 cases examined by us where the sputum was collected with due precautions against mouth contamination, 162 patients suffered from pulmonary tuberculosis. In only one of these cases were spirochaetes found, while, as mentioned above, they were found in 59.2 per cent. of unwashed sputum of 331 tuberculous patients. Out of the 162 cases, 17 had hæmoptysis. In none of these were spirochaetes found.

*Spirochætal infection in cavities in pulmonary tuberculosis.*—It is generally recognized that cavities in tubercular lungs are predisposed to secondary mixed infections with the ordinary pyogenic organisms such as streptococci, staphylococci and pneumococci, commonly found in the mouth (Hayes)(21). It is pointed out by Pilot(11), and his co-workers that spirochaetes and fusiform bacilli may also cause secondary infections in tubercular cavities along with the other organisms mentioned above. They say that foul-smelling sputum is the characteristic feature of this type of secondary infection.

Among the 162 tubercular patients, 122 showed signs of cavity in the lungs. None of these, except one, had spirochaetes in properly collected sputum. No spirochaetes were found even in the sputum of one who had foul-smelling sputum, while in the only case where spirochaetes were found the sputum was not foul smelling.

*Spirochætal infection and bronchitis.*—From the description given by Castellani(12) of "broncho-spirochaetosis" the conclusion to be drawn is that the spirochaete is the cause of bronchitis where the sputum contains spirochaetes but no tubercle bacilli. Schwarz supports Castellani and Campbell Faill(9) confirms the finding of Castellani that spirochaetes are the cause of bronchitis with blood stained sputum. Unfortunately, it is not stated by these authors whether in their investigations due precautions had been taken against mouth contamination. Jackson(22), Campbell and Dyas(23), and Smith(10) report cases of acute bronchitis due to spirochætal infection.

In the group of 162 cases examined by us there were 14 cases having bronchitis as a complication. Six of these had no tubercle bacilli in the sputum and 2 with tubercle bacilli in the sputum had hæmoptysis also. In the sputum of none of these 14 were spirochaetes found.

*Spirochætal infection and unresolved pneumonia and bronchiectasis.*—It is stated by Smith(10), Pilot(11) and co-workers that the cause of certain cases of unresolved pneumonia and bronchiectasis, is spirochætal infection. In 6 patients out of the 170 who had no tubercle bacilli in the sputum, but had signs in the lungs suggesting partially unresolved pneumonia or beginning bronchiectasis, no spirochaetes were found in the sputum collected in the proper way.

*Spirochætal infection and lung abscess.*—Smith(17) believes that lung abscesses are usually caused by spirochætal infection and gives experimental evidence.

Out of the group of 170 who were all sent to the Sanatorium as tuberculous patients, two were found to be suffering from lung abscess and not tuberculosis. In the sputum of these two cases spirochaetes were repeatedly found. This suggests that the finding of others, that lung abscess is caused by spirochaetes, is correct.

#### CONCLUSION.

Spirochaetes in association with fusiform bacilli must be considered normally present in the mouth. They were found in 93 per cent. of gums examined and in 34 per cent. of tonsils. The frequent presence of these organisms in the sputum is due to contamination from the mouth. The sputum of 331 patients has been examined without previous washing of the mouth and the sputum and spirochaetes were found in 59 per cent. of these cases. On the other hand in 170 cases where the mouth and the sputum were first washed, spirochaetes were found in the sputum in only 3 cases or 1.8 per cent.

Among these 170 cases, 162 were patients with pulmonary tuberculosis. Out of these 162 cases, 17 were complicated with hæmoptysis, 122 with cavities in lungs. Inasmuch as spirochaetes were not found in any of these 162 cases, except in one, it is not likely that spirochætal infection has any significance regarding complications with hæmoptysis, or with secondary infections in cavities, in pulmonary tuberculosis.

Bronchitis was a complication in 14 of these 162 cases. Six of these had no tubercle bacilli in the sputum, and 2 with tubercle bacilli in the sputum had hæmoptysis also. In the sputum of none of these were spirochaetes found. Therefore it appears that spirochætal infection is not significant in bronchitis.

Out of the 170 cases, 8 were non-tuberculous: Six of these were suffering from unresolved pneumonia or beginning bronchiectasis. In none of these were spirochaetes found. The remaining 2 were suffering from lung abscess, and in both of these spirochaetes were found repeatedly. This suggests that the finding of others, that lung abscess is caused by spirochaetes, is correct.

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### CONTUSION OF THE EYE AND COMMOTIO RETINÆ.

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CONTUSION of the eye and of its environs, i.e., injury direct or indirect by the transmission of concussion or shock, which does not produce rupture of the capsule of the eyeball causes a great variety of lesions. These lesions are best divided into two groups, those produced in the anterior segment, and those produced in the posterior segment of the eyeball. Among the latter is a condition known as commotio retinæ which, being very rare and interesting, deserves recording.

Mr. V. D., aged 26, a young Mahomedan, used to perform the feat of jumping over a distance of 25 feet in a Ford car in Parasram's Lion Circus which came over here for a short time. He used to have two slanting platforms placed about 25 feet apart, the ends of the platform facing each other being about 4 feet high, while their other ends sloped down to the level of the grounds on either side. He used to come in his old model Ford car at a certain speed and travelling up one of the inclined planes took a leap from the 4 feet high end into the air to a height of about 8 to 10 feet and then dropped on the higher end of the other plane, then sliding down the slope to the ground on the opposite side. On 27th July, 1929, while performing this feat he jumped all right on to the opposite platform, but, having taken a higher jump, instead of landing on the front wheels he landed on the radiator and the front of his car, with the result that the car turned turtle and he was buried underneath. He received a severe concussion injury to his head and scapula, and one of the radii of the broken steering wheel struck his left malar eminence and caused a big cut half an inch below the outer angle of his left eye. He was admitted to hospital suffering from the effects of concussion and shock. After two or three days, having partly recovered from these effects he complained of loss of vision in his right eye, though the wound was on the left side of the face. Major Candy, Civil Surgeon, kindly asked me to examine him. I did not then know much about his injury but found that there was some conjunctival ecchymosis, more in the left eye than

in the right, and that the right pupil was a little contracted and sluggish in reaction to light. Homatropine and cocaine was used and as he could not be removed from his bed I had to examine him in the recumbent position on the verandah of the ward by the indirect method. The fundus appeared to me very much like that of an extensive retinitis with hæmorrhages in the retina and some in the vitreous. Two days later when he could sit up he was properly examined in the dark room and his fundus revealed a true picture of commotio retinæ, traumatic œdema of the retina, concussion of the retina, or Berlin's opacity as it is also called, a very rare and interesting eye disease.

*Examination of right eye.*—No changes were seen in the anterior segment of the globe except a small conjunctival hæmorrhage. The optic disc was hyperæmic and the retinal blood vessels were dilated, chiefly the veins. On the outer side of the disc both above and below the macula were noted numerous greyish-white spots, more or less circular. These were irregularly disseminated in the area above the macula but seemed to coalesce to form a more or less uniform milky white cloudiness or opacity in the area below the macula. The macular region did not seem to be noticeably affected. The lower opacity was arching underneath it as it were. The retina in this region was much raised as could be seen from the blood vessels overlying it. No folds in the retina or tortuosity of the vessels, the distinguishing character of a detachment, could be seen. There were numerous hæmorrhages in the retina and a tag was seen floating in the vitreous. The brunt of the mischief was located on the outer side of the disc above and below the macula, though a few similar and isolated opaque white spots were also seen on the nasal side some distance from the disc.

*The left eye.*—In the left eye, that is the side on which the broken steering wheel had made a cut below the outer angle of the eye, about four such opaque white spots of exudation could be seen on the outer side some distance above the disc; except for these it was normal.

This condition was first described by Berlin in 1813 and according to him is an "œdema of the retina"; according to Leber it is "a stretching of the retina with minute laceration" (Fuchs). A severe contusion is usually the cause. The part of the retina to be affected is usually opposite to the point of impact of the blow. Experiments made to elucidate the pathology of this condition suggest that "it is an œdema of the retina brought about by transudation in consequence of the traumatic vascular paralysis of the choroidal vessels. The fluid enters the retina by diffusion," (Roemer). Collins and Mayo also state that in commotio retinæ, produced experimentally, examination of the eyes reveals the presence of an extravasation of blood between the choroid and the sclerotic, and this extravasation, causing pressure upon the delicate vascular layers of the choroid, produces a condition of ischæmia in it. We know that the outer layers of the retina derive their nutrition from the chorio-capillaries of the choroid and when these are pressed upon a serous effusion occurs in the retina, and a swelling of the outer layers takes place and the opacity develops. On the resumption of the circulation in the choroid due to the absorption of the extravasation, the opacity in the retina also begins to disappear and the *status quo* may again become established. If, however, the ischæmia of the choroid takes too long to disappear the inner elements of the retina, the rods and cones,



may also become damaged and then atrophy of the retina and only partial restoration of its function may be the eventual outcome. The epithelial cells of the retina having a greater resisting power, then proliferate and penetrate forwards into the retina and produce the pigmentation sometimes seen as the end result. The causes are direct injury, or, as it occurred here, a contre-coup, i.e., for an injury to occur at one macula, some part of the anterior half of the eyeball or the orbit opposite to it should receive the blow. In the case of a blow on the cornea the opacity in the retina would be most marked around the disc, the fovea standing out prominently near this white background. The impact and the injury need not necessarily be exactly opposite, for it is the direction of the impact that counts and determines the seat of the injury that follows, and I have no doubt that the impact of the steering wheel on the bone just below the external commissure of his left eye gave rise to the opacity at the macula in the right eye, the result of the contre-coup, as there was no external evidence of any injury whatever on the right eyeball or the eyelids or its neighbourhood.

The treatment carried out was of the ordinary nature.

Atropine in the effected eye, complete rest in bed and a bandage over both eyes was enjoined for the greater part of the day. He had leeches and inunctions of blue ointment on his temples and internally potassium iodide and mercury, supplemented with saline subconjunctival injections. The vision in the right eye improved to 6/60 on the 12th August, 1929, and the patient felt sufficiently well to start taking the jump once again in spite of being heartily advised not to do so. On the 18th August his vision in the right eye improved to 6/36 and he left the city with the circus for Nadiad. On the 28th August when he returned, the vision had improved to 6/12 in right eye and in the left eye it was 6/5. On examination it was seen that a large part of the opacity in the retina, particularly in the upper part, had disappeared, but a faint opacity was still present in the lower region with some mottling and pigmentation there. The patient turned up again on 27th September 1929, exactly two months after the injury, and it was found that the vision in the right eye had improved still further, nearly to normal, i.e., 6/6. The opacity in the retina had completely disappeared and nothing remained except some mottling of the fundus in that region.

My thanks are due to Major Candy for allowing me to treat the case.

### FILARIAL PERIODICITY.

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THE periodicity of the fever in infections with *Filaria bancrofti* in this country is not strictly periodic or regular. The parturition cycles

of different adult female worms may fail to be simultaneous, whilst some parturition cycles may fail to produce fever or other symptoms. Every attack does not always mean fever, nor is every filarial attack of fever followed by lymphatic manifestations. Textbooks on tropical medicine do not often draw attention to afebrile infestations with *F. bancrofti*, but such cases are not uncommon. The two following may be cited as examples:—

*Case 1.*—A Hindu lawyer, aged 32, who complained of a painful swelling in the left calf almost every 8th day of the lunar month. The swelling was tender to the touch and used to persist on each occasion for three or four days. There was no pyrexia at all. His grandmother is a sufferer from chronic filariasis with elephantiasis of the legs. The patient's symptoms were cured by six graduated injections of typhoid vaccine.

*Case 2.*—A Hindu male, aged 12, who complained of gradual swelling of the left foot with pain in the calves. The swelling grew in size at each full moon period, and when first seen, he had had three such periodical recurrences. The left inguinal glands were enlarged. There had never been any fever during the four months that the condition had persisted. No microfilariae could be found in his blood film, but the eosinophile count was as high as 7 per cent.

*Case 3.*—A Hindu male, aged 48, whose first attack was associated with funiculitis and orchitis. Double-sided hydrocele developed, but there was no recurrence of the funiculitis or lymphadenitis. This patient, however, suffers still from typical filarial fever off and on, and his blood films give positive findings.

With regard to the different factors associated with the disease one may mention the following:—

*Heredity* apparently plays no part, though sometimes four or five members of the same household may be affected, presumably on account of mosquitoes in that locality being heavily infested.

*Sex.*—In Birbhum the incidence in males is three times as frequent as that in females.

*Age.*—Adults are most commonly affected, though the primary attack seldom occurs after 30 years of age. According to Tice, workers in the tropics seldom see filariasis in patients under 14 years of age, but the writer has seen filarial orchitis in a child one month old, and orchitis and even elephantiasis of the legs have been seen in children of 12.

*Season.*—The disease is most prevalent in July and August during the rains; next in frequency come the months of March and April. The incidence is lowest in September and October. Low humidity is an important factor, though warmth favours the development of the larvæ in the mosquito, and warmth and moisture make the larvæ more active and favour their entry from the proboscis of the mosquito through the skin of man.

*Caste, etc.*—There is a lower incidence among Mahomedans and Christians in this district than amongst Hindus. Amongst the Hindus, those of the Gandhabanik class are especially susceptible, the incidence amongst them being greater in every house.

## PREDISPOSING FACTORS.

*Trauma.*—Orchitis and funiculitis are often preceded by a slight blow in a new victim; occasionally a former sufferer has a fresh attack of localized filariasis at the site of some injury. Trauma perhaps devitalizes the part.

*Overwork* predisposes a previous sufferer to a fresh attack.

*Intestinal stasis.*—An acute attack of filariasis often follows intestinal stasis, and frequently a cathartic in a confirmed sufferer will avert an attack. Possibly the dose of cathartic may either (i) prevent the birth of microfilariae, or (ii) prevent the entrance of microfilariae from the deeper lymphatics into the peripheral circulation. Under such circumstances the difference in pressure between the thoracic duct and the internal jugular vein may not be favourable to the larvæ entering the venous circulation.

There are certain obscure points about the manifestations of filariasis which require to be answered. Thus:—

(i) Why is it that in different individuals different parts of the system, e.g., the legs, arms, genitalia, breasts, etc., are affected?

(ii) Why do some individuals show life-long manifestations in one leg, others in the scrotum, others in both, others in both legs, or in legs and arms?

(iii) Why does the local condition go on to suppuration in some cases, and not in others?

(iv) Why are some affected individuals attacked with erysipelas, septicæmia, etc., and not others?

(v) Why is the periodicity of the attacks, though definite, not entirely regular? Also, what is the connection with the lunar cycle?

(vi) Why is treatment wholly beneficial to only a few, partly beneficial to others, and not at all to the rest? Why does one form of treatment suit some, but not other, cases?

Like the malarial paroxysm, filarial fever is more or less of the nature of an anaphylactic shock. The rigors, vomiting, the high temperature, and the connection with intestinal stasis are all suggestive of colloidoclastic (protein) shock. Further, it is generally stated that if the patients rest during the day time and work at night, the periodicity is reversed, the microfilariae then invading the blood stream during the day time. But this does not explain why (i) some patients have their first attack of fever at night, others get irregular fever during the day time, still others show irregular fever during the whole 24 hours. (ii) In some microfilariae cannot be found in the blood at the time of fever, even if at night.

According to periodicity, our patients may be grouped as follows:—

(i) *Seasonal type.*—These patients get fever only at certain times of the year, chiefly during the rains from June to September, but in other instances in the winter. They are absolutely free from attacks at other seasons. During the febrile season they get frequent attacks, once a week

or twice a month, accompanied by eosinophilia almost invariably. This group also includes patients who get only one attack a year.

(ii) *Lunar type.*—This class forms the majority of our patients. These patients develop symptoms either at new moon, on the 8th or 11th day of the lunar cycle, or at full moon. There is regularly one attack in each lunar cycle. The relationship of filarial periodicity to the lunar cycle at present remains a mystery.\* Perhaps at these periods the body immunity is at a low ebb, or the tissue fluids are in a condition favourable for the microfilariae to invade the peripheral circulation.

(iii) *Irregular type.*—These are the chief sufferers. The patients first have fever once a month, then some four or five attacks are followed by two or three bouts of fever during a single month. There may then be some cessation followed by most irregular febrile attacks.

(iv) *Chronic type.*—This usually follows on the irregular type of case, intervals of three or four years occurring between the attacks.

(v) *Septicæmic type.*—That filarial septicæmia does occur, and that it may prove fatal, is an admitted fact. But whether it is due to secondary streptococcal infection or to absorption of some toxin from dead microfilariae, it is difficult to say. The following are illustrative cases:—

*Case 4.*—A Hindu widow, aged 54, a sufferer from chronic filariasis with elephantiasis of both legs. On the 11th day of a lunar period I saw her when she was suffering from an intense attack of fever, with a temperature of 105°F. There was intense pain, with redness and swelling, in the left breast. The left axillary glands were also enlarged. Within four hours she developed coma and delirium. The urine was free from albumin and sugar. I gave a subcutaneous injection of 12 cgms. of sulfarsenol, but she succumbed within 24 hours.

*Case 5.*—A Hindu male, aged 48, who had had an elephantoid scrotum for many years. As was usual, one night he had fever with rigors, and intense pain, redness and swelling in the scrotum. Coma and delirium developed within a few hours of the onset of the attack, and he died within 48 hours.

*Case 6.*—A Hindu male, aged 24, who had suffered from filariasis for one year. There was a right-sided hydrocele with swelling and tenderness of the right inguinal glands. He used to have an attack once a month, lasting for 24 to 36 hours, the attacks beginning with chill and rigor. There were inflamed red streaks along the anterior aspect of the right thigh (inflamed lymphatic channels). The patient was conscious, but had had several stools with blood and mucus in them. The parents had no idea of the gravity of the case. The patient passed half a dozen such stools and then collapsed and died, without medical assistance having been summoned.

*Case 7.*—An up-country man, aged 38, brought to the Medical College Hospital with coma, generalized

[\*The attention of the reader, as well as that of the author, is drawn to Col. Acton and Dr. Sundar Rao's article which appeared last year in the November number of this *Gazette*. These writers give a very satisfactory explanation of this phenomenon; it is probably a question of periodicity in giving birth to the larvæ by the adult gravid female worm, the birth of larvæ being accompanied by the ejection of a toxin which causes the fever. Many other questions raised by the writer of the present article have been dealt with in the paper referred to above.—EDITOR, I. M. G.]

lymphadenitis, and high fever. The case was suspected to be one of plague, but examination of blood films and of gland puncture films showed myriads of microfilariae. After injection of salines, etc., this patient recovered.

Post-mortem examination in two such cases of filarial septicæmia showed myriads of microfilariae in the bone marrow, spleen, liver, and the arteries of the brain.

#### COMPLICATIONS ALTERING THE COURSE OF FILARIAL PERIODICITY.

(i) *Sepsis*.—Secondary infection with either staphylococci or streptococci or both may occur and suppuration may take place in some cases. The temperature then becomes remittent or of a hectic type.

(ii) *Erysipelas* may set in in the affected part, and give rise to a temperature chart of a characteristic type. Curiously enough, after recovery

and persist for many days. The following is an illustrative case:—

*Case 8*.—A Hindu male, aged 45, a case of chronic elephantiasis of the scrotum, one day commenced to suffer from hæmochyluria. The fever lasted for only a few days, but the chyluria proved resistant to soamine, sulfarsenol, and injections of vaccine. His urine and blood both showed microfilariae. He succumbed from asthenia within two months.

(v) *Nervous manifestations*.—It is curious how nervous symptoms may occur in these patients, and with periodical regularity; probably the microfilariae in such cases invade the meningeal vessels. Headache and nervous hyperexcitability are sometimes features following after an attack of filarial fever. The following two cases illustrate this:—

*Case 9*.—A Hindu female, aged 26, with a history of chronic filariasis and elephantiasis of the right leg.



Marked pigmentation of the left leg with elephantiasis of both legs, the scrotum and the penis.

from such a condition, the patient often appears to have become immune to further attacks of filariasis.

(iii) *Diarrhœa* may occur; its ætiology is obscure. Possibly it is due to rupture of engorged and inflamed lymphatics in the gut, or to secondary streptococcal invasion. The prognosis is bad.

(iv) *Chyluria* may occur, and may be present together with elephantiasis of the scrotum or the legs. It may set in with the onset of the fever

One night she had a typical attack of filarial fever with pain and increased swelling of the leg. On the second day she developed diarrhœa, and after five or six stools collapsed. Stimulants were administered and she recovered, and the fever subsided within three days. She now, however, developed a staccato speech and nodding movements of the head. The tremors were involuntary, could not be checked, and occurred two or three times a second. They were also visible in the outstretched hands and in the tongue. The knee jerks were exaggerated. She was treated with calcium and parathyroid extract and Luminal for a week, and the tremors disappeared. Are these nervous manifestations

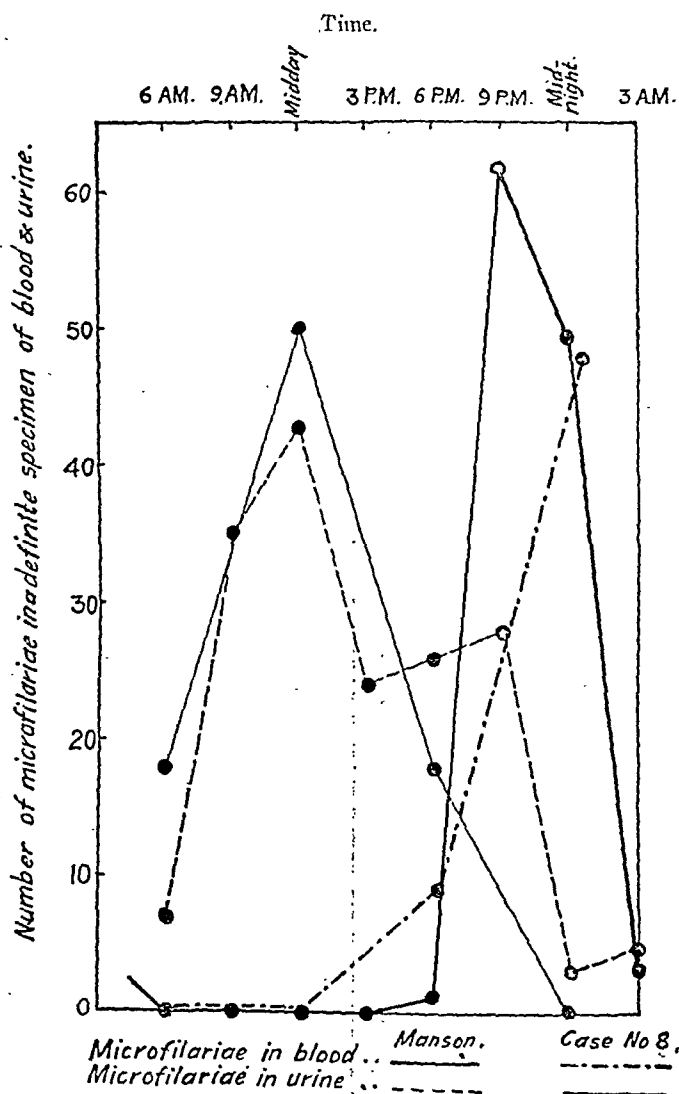
due to inflammation of the neurolymphatics of the corpus striatum, or of its vessels?

Case 10.—A Hindu male adult, a sufferer from chronic filariasis, developed stiffness and pain in the neck after one of his usual attacks of fever. There were no enlarged glands palpable in the neck, nor any other sign of local inflammation.

(vi) *Pigmentation*.—Pigmentation occurs in the chronic elephantoid masses. Perhaps it is due to destruction of the trophic nerve fibres, their nutrition being cut off by hypertrophy of the skin and blockage of the lymphatics. The

Case 11.—A Mahomedan female, a nullipara, aged 28, a widow, who had had elephantiasis of her right breast, with enlargement of the right axillary glands for some ten years. She gradually developed a hardness in the tumour of the breast, with increase in its weight and excruciating pain. On examination the mass was found to be of stony hardness, with the right axillary glands also of stony hardness, and also solid swelling of the right arm. The case was an inoperable one, and the patient died from cachexia and septic fever; a few months before death there developed a typical malignant ulcer over the affected breast.

Case 12.—A Hindu female, aged 44, multipara, had had filarial elephantiasis of the right breast since the



patient whose photograph is here shown showed marked pigmentation of the left leg, with elephantiasis of both legs, scrotum, and penis.

(vii) *Carcinoma*.—It is easy to understand how carcinoma may invade tissue involved in filarial elephantiasis, for (i) there is constant irritation of the part, and (ii) there is poverty of the lymph supply due to blockage of the lymphatics by the dead filariae or by invasion with secondary septic organisms. Probably in such cases the patient has a predisposition to carcinoma. The following two cases are illustrative:—

age of 18. She consulted no one until increasing pain and heaviness in the breast made it certain that the condition had become malignant. Examination of sections of the tissue confirmed the diagnosis of malignancy, and after amputation of the right breast and removal of the axillary glands, she is now under radium treatment.

(viii) *Filarial colic*.—This is a condition where the patient, after or during a typical attack of filarial fever, complains of extreme pain in either (i) the right or left iliac fossa, (ii) the epigastric region, (iii) the right or left kidney region, whilst there are often present vomiting, chill, and

fever. Such cases are often mistaken for ones of appendicular, gastric renal, or intestinal colic. After a few hours the pain may spontaneously disappear. The following is an illustrative case:—

Case 13.—A Hindu male, aged 30, was suddenly seized on the 11th night of the lunar cycle with intense colicky pain in the left iliac fossa and vomiting. He soon became unconscious, with pyrexia. Next morning the pain abated, but the fever lasted 72 hours. The next month he had a similar attack, with orchitis on the right side in addition. After three or four such attacks a solid œdema of the right leg developed, and the diagnosis of filariasis was confirmed by examination of the blood at night.

Case 14.—An Anglo-Indian female, aged about 48, was admitted to the gynaecological department for (i) dull pain in the left loin, often giving rise to pain of a colicky nature with vomiting; (ii) a hectic type of fever. At first sight the case was taken to be one of pelvic trouble, but vaginal examination revealed nothing abnormal. When referred to the medical side, the case

Time.	6 a.m.	9 a.m.	Mid-day.	6 p.m.	9 p.m.	Mid-night.	3 a.m.
Blood .. ..	0	0	0	1	62	50	10
Urine .. ..	7	36	43	24	26	28	34

was taken to be one of renal colic, but radiography showed nothing abnormal. Finally, one night she had high fever, and examination of the blood showed

Time.	6 p.m.	Mid-day.	6 a.m.	Mid-night.
Blood .. ..	1	0	0	48
Urine .. ..	18	50	18	0

microfilariae present. A course of intravenous injections of soamin relieved her of all symptoms. This colic may be due to inflammation of the perirenal lymphatics.

The other forms of colicky pains are due to invasions of the intestinal lymphatics plus stasis, or in some cases to inflammation of the spermatic lymphatics following the course of the spermatic vessels of the cord.

#### PATHOGENESIS.

Filarial periodicity is evidently produced in one of two ways. Firstly there may be a fixed population of microfilariae within the body, which shelter in the internal viscera during the day time, and only enter the peripheral circulation at night. According to Manson "The deeper parts where they retire are the larger blood vessels, particularly arteries; they mostly lodge in the blood vessels of the lungs." If this is true, at post-mortem examination one would expect to find many more microfilariae in the lungs of patients who died during the day time than in those who die at night; but this is not the case.

The other possibility is lodgement of the microfilariae in the larger blood vessels during the day time. It is difficult however to imagine how this occurs, and Fulleborn has found microfilariae in myriads in the circulating blood within the heart at post-mortem examination.

Fulleborn holds that, together with the contraction of the superficial blood capillaries at night, the larvæ take up a slightly bent attitude, and are thus retained during the day time in the deeper capillaries and pre-capillaries, but that in shed blood this bent attitude is not shown.

Manson failed to find microfilariae in two cases where blood was aspirated by spleen puncture. Yet if microfilariae are not present in the deeper organs during the day time, how are we to explain their presence in such organs at post-mortem examination?

Other workers state that filarial periodicity is an expression of periodicity on the part of the gravid female *F. bancrofti* in giving birth to her larvæ. But if the microfilariae are absent from the internal viscera during the day time, then there must be an enormous daily destruction of them. Manson gives the following observations on three-hourly findings in a patient followed up for six consecutive nights and days, as to the number of microfilariae present in a blood smear  $1\frac{1}{2}$  by 1 inch in size, and in the deposit from one ounce of chylous urine from a case. The actual number of microfilariae present were as follows:—

In my case No. 8 the same plan was followed, and the figures were:—

The chart shows that the urinary periodicity is entirely different from the blood periodicity.

This shows that filarial embryos are constantly passing to the lymph stream, and the figures in the table do not give their true incidence in the lymph. Manson-Bahr observes that multitudes of microfilariae die or are cut off from the main blood stream by inflammatory blockage. He also found that they did not live at body temperature in citrated blood for more than 12 hours, but in citrated blood at room temperature they survived for three days. Now, if microfilariae are short-lived, how are they disposed of? There are two possibilities. (i) Meyer in China reports that death and dissolution of the microfilariae occurs in the plasma, and is more rapid in the morning than in the evening blood. Perhaps, just as there is a lysozyme in tears which has a bactericidal property, so perhaps there exists in the blood some substance lethal to microfilariae. (ii) Rodenwaldt implicates the renal medulla as a veritable burying ground of microfilariae. Anderson found dead microfilariae in process of dissolution in the liver, spleen, and lymph glands.

To sum up, the microfilariae perish rapidly within the blood stream, whilst the filarial periodicity is the result of cyclical parturition, and is adapted to the habits of the transmitting mosquito host. We are still, however, too much in the dark with regard to the pathogenesis and mechanism of filarial periodicity. The mighty elephant of Truth stands unexplored, and we, like the blind fellows in the fable, feel its legs

and declare them to be mighty pillars, or its ears and take them to be mighty fans, each thinking alike that he is the nearest to the truth.

### SOME OBSERVATIONS ON AN UNUSUAL EPIDEMIC OF MALARIA IN THE CITY OF LUCKNOW (APRIL—SEPTEMBER 1929).\*

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#### INTRODUCTION.

THE city, which is the largest in the United Provinces, is located mainly on the south bank of the Gomti river. The Gomti river forms a very definite landmark, as well as one of the most important physical features of the city from a malarial point of view. The city is divided for purposes of municipal administration into eight wards, seven being on the south and one on the north of the river.

Another landmark of importance is the bed of the obsolete Ghazi-Uddin Haider "nala" which enters the municipal limits west of the Aishbagh Railway Junction and continues close to the southern boundary till it meets the Gomti river. Part of this disused "nala" was culverted in 1928 and the work is still proceeding.

The population of the city, according to the census of 1921, was 2,17,167. The crude death rate for 1928 was 45.65 and the mean death rate for the previous five years (1923—27) was 39.76 per 1,000 of population. The birth rate for the year 1928 was 51.89, and the mean birth rate for the previous five years (1923—27) was 47.47 per 1,000 of population.

There is no evidence to show that Lucknow in the past was ever visited by an epidemic of malaria, and although the town was not free from malaria, the incidence as judged by spleen rates

was only 3.1 per cent. in 1913. Since then, owing to various anti-malarial schemes carried out, this rate has further fallen to 1.4 per cent. (1923).

#### PRESENT OUTBREAK.

The present outbreak was coeval with the usual benign tertian rise in March and April. The first indication given was a sudden increase in the hospital attendances under fevers and this was followed by an unprecedented rise in the mortality from fevers. The high death rate in the benign malaria season when epidemics of malaria are unknown and in the absence of any marked increase in the carrier anophelines until May, led us to suspect that the basis of the high death rate must be a fever of very toxic clinical manifestations. There is some evidence to suggest that the early rise in the benign season was complicated by a malaria-like undifferentiated fever associated with enlargement of the liver and spleen and the presence of jaundice.

In order, therefore, to determine the true nature and extent of the disease causing this high death rate, a very systematic and careful investigation was undertaken and the following are in brief the findings:—

#### (1) EXAMINATION OF HOSPITAL CASES.

An examination of the local dispensary returns shows that attendance under fevers was higher from January 1929 onwards as compared to the average of the previous four years. This rise was, however, further accentuated from April right up to September with the peak in May.

It is to be noted, however, that the absolute increase is most marked in August, but this is more apparent than real when compared to the normal of previous years. Thus the rise in the rate per 1,000 of population in August 1929 is 5.1 times the average of the previous four years for August, while that of May 1929 is as much as 6.1 times the average for May.

Fever attendance in the city hospitals is as follows:—

Month.	4 years' average of fevers (1925—28).	Rate per 1,000 of population.	1929.	Rate per 1,000 of population.	Number of times greater than the average of pre- vious 4 years.
January ..	1,001	4.61	2,326	10.71	2.3
February ..	1,036	4.77	1,823	8.39	1.7
March ..	1,691	7.79	3,377	15.55	2.0
April ..	1,945	8.96	8,761	40.34	4.6
May ..	1,948	8.97	11,958	55.06	6.1
June ..	1,607	7.40	2,594	34.97	4.7
July ..	1,964	9.04	10,705	49.29	5.4
August ..	3,152	14.51	17,364	79.96	5.1
September ..	3,283	15.12	13,320	61.33	4.1

\* Being a paper read at the Medical and Veterinary Section of the Indian Science Congress, Allahabad, January, 1930.



The following comparative statement shows the deaths under fevers month by month:—

the liver. All these 144 had a history of enlarged spleen. The average duration of fever varied from 2 to 10 days before death.

MORTALITY.					
Month.	Deaths from fevers—4 years' average (1925—28).	Rate per 1,000 of population.	Deaths from fevers (1929).	Rate per 1,000 of population.	Number of times greater than the average of previous 4 years.
January ..	61	0.28	143	0.66	2.3
February ..	61	0.28	184	0.85	3.0
March ..	109	0.50	339	1.56	3.1
April ..	185	0.85	607	2.79	3.2
May ..	235	1.08	1,315	6.05	5.6
June ..	246	1.13	742	3.42	3.0
July ..	160	0.73	312	1.44	1.9
August ..	169	0.77	782	3.60	4.6
September ..	167	0.76	800	3.68	4.8

From the statement given above it will be seen that deaths from fevers have been appreciably high since the beginning of the year. In the earlier months of the year as smallpox, measles and plague were prevalent in the city it is possible that some of these have been shown under fevers, but from May onwards in the absence of any other epidemic disease, the deaths under fevers can be taken to represent the true fever mortality and this, as will be seen from the table given, has been as high as 5.6 times the average figures for 4 years in the months of May and 4.8 times those of September.

It will also be seen that the absolute increase in the number of deaths is more marked in the month of May, as there were as many as 1,315 deaths, while in the month of September there were only 800 deaths. A comparison of the mortality figures with the dispensary records of fever attendance shows that the two do not follow one another very closely. Roughly speaking the increase of mortality followed the increase in sickness but the case fatality rate varied from month to month.

It is very difficult to calculate a correct case fatality rate as all the cases in the city did not come to the hospitals, nor were all the reported deaths verified by qualified agencies.

#### VERIFICATION OF DEATHS.

Three hundred of the deaths under fevers were verified by house-to-house inspection. These deaths were taken at random in the various wards of the city. Particulars regarding each death were recorded upon a slip and whenever a diagnosis by a qualified medical man was available, the particulars were obtained from him and the results of various sortings were noted.

Of the 300 deaths investigated 144 could be definitely attributed to malaria. Out of these, 39 had very marked symptoms of abdominal pain with dysenteric stools particularly in the period immediately preceding death, and 7 had very pronounced jaundice, and enlargement of

The mortality (January to August 1929) according to age groups is as follows:—

Still births .. ..	334	(Previous 4 years' average—258 for the same period.)
Children under one year ..	995	
1 to 5 years ..	1,007	
5 to 10 years ..	250	
10 to 15 years ..	159	
15 to 20 years ..	163	
20 to 30 years ..	278	
30 to 40 years ..	270	
40 to 50 years ..	281	
50 to 60 years ..	335	
60 and upwards ..	686	
	4,758	

Of the 4,758 deaths at Lucknow during the months of January to August 1929, 2,336 or 49.1 per cent. deaths were therefore in children under 5 years of age, as against 2,422 or 50.9 per cent. for all other ages; 1,021 or 21.4 per cent. deaths were in persons 50 years and over.

Associated with the increased mortality there was also a definite increase in the reported still births. During the period January to August 1929, there were 334 still births against 258 still births, the average of the corresponding period of preceding 4 years (1925—28).

#### METEOROLOGICAL.

(1) The average range of temperature shows a considerable variation from season to season. In the cold weather the minimum temperature drops down to about 34°F. and in the summer months the temperature in the shade is as high as 116°F.

(2) The average rainfall per annum varies from 17 inches to 62 inches over a period of 30 years (average approximate 38 inches). It is not proposed to discuss at length the meteorological data, as since the flood of 1924, the variations in temperature and humidity have been within normal limits and not sufficient to affect the incidence of malaria unduly in the succeeding years. There are, however, two important

facts:—(i) the year preceding the present outbreak was one of drought, and (ii) this year (1929) there was an excessive rainfall in the period between the middle of July and the middle of August, the excess being about 15 inches above the normal of the past three years for the same period. The rise in the fever incidence during August and September is partly attributable to the heavy rainfall in July and partly to relapse of infection contracted in the months of April and May.

#### SPLEEN RATE.

The splenic rate observed in different areas of Lucknow in the month of August 1929 is as noted below:—

of benign tertian infection; 225 or 24 per cent. malignant tertian, 7 or 0.8 per cent. quartan and 41 or 4.2 per cent. were mixed infections (benign tertian and malignant tertian parasites). Four per cent. of the slides showed sexual forms—(crescents or benign tertian gametocytes).

The morphology of the parasites did not differ from any of the recognised forms. The intensity of infection was in most cases very severe: roughly 80 to 100 parasites per 200 red blood cells in about 50 per cent. of both the malignant tertian and benign tertian slides. This intensity of infection by benign tertian parasites has never before been seen in this province during any survey.

Name of ward.	Location of ward, central or on outskirts of city.	Number of children examined.	Number of children found with enlarged spleen.	Percentage with enlarged spleen.
1. Hazratganj ..	Both ..	328	21	6.4%
2. Hasanganj ..	Mostly outskirts ..	155	15	9.7%
3. Ganeshganj ..	Purely central ..	495	25	5.0%
4. Wazirganj ..	Mostly central ..	696	127	18.3%
5. Yahyaganj ..	Purely central ..	220	108	49.0%
6. Chowk ..	do. ..	183	57	31.1%
7. Saadatganj ..	Partly central ..	111	13	11.7%
8. Daulatganj ..	Outskirts ..	242	43	17.7%
TOTAL ..		2,430	409	16.8%

Of the 2,430 children examined 409 or 16.8 per cent. showed enlarged spleens varying in size from one to three finger-breadths. Of the 8 wards in the municipality, Yahyaganj and Chowk wards showed spleen rates as high as 49 per cent. and 31 per cent. respectively. The spleen rate figures in 1913 and in 1923 were never more than 3.5 per cent. in any of the wards of the city.

From the above figures it will be seen that the spleen rate has been very high, more especially in the wards centrally situated, with the exception of Ganeshganj ward. This fact when considered with other findings brings out certain very remarkable features of the epidemic and has an important bearing on the epidemiology of the disease. It will be discussed later on in the report.

#### BLOOD EXAMINATION.

During the period under review 1,519 blood slides were examined. The blood slides were taken at random from the cases attending for fevers in the various hospitals of the city. Of the 1,519 slides examined 941 or 61.9 per cent. were found infected with malarial parasites. Of these positive slides 668 or 71 per cent. were

#### ENDEMIC INDEX.

In order to determine the percentage of children harbouring malarial parasites, blood slides were taken from 350 children in the various schools of the city. Of the 350 slides examined 55 or 16 per cent. were found infected with malarial parasites and 3 per cent. of the positives showed crescents and *P. vivax* gametocytes.

#### BREEDING GROUNDS OF THE ANOPHELINE MOSQUITOES.

The principal active breeding grounds in Lucknow have been as under:—

1. Stagnant pools in the bed of the Ghazi-Uddin Haider "nala" which passes through the city.
2. Some 25 sewer outfalls, or storm water channels on both banks of the river Gomti and the edges of the river itself.
3. Irrigation tanks in the public gardens.
4. Tanks in private gardens.
5. La Martinière Lake.

6. Temporary collections of rain water in low lying areas of the city.

#### 7. Wells.

All these breeding grounds are systematically and regularly fished for anopheline larvæ each year and as soon as it is discovered that the breeding of mosquitoes has started extensive oiling or Paris-greening is commenced. In April and May 1929 there was an abnormal amount of anopheline breeding in the river owing to the fact that the sluice gates, which are let down once a week as a routine in order to flush out the river, were out of order. Since May there has been practically no breeding of anopheles in the river, as the gates were repaired.

It appeared that the earlier part of the epidemic, or the abnormally higher seasonal incidence of the normal benign tertian rise, was due to breeding in the edges of the Gomti river. During the rains it was found that "kachha kalas" were breeding *A. culicifacies*. This finding was peculiar and was probably caused by the fact that the rains were exceptionally heavy and backwaters in nalas previously too foul to breed carrier anophelines became active breeding places. As the season progressed, it was found that the cases as well as deaths were becoming more numerous in the Chowk, Saadatganj and Yahyaganj wards and in the central portion of the town. These wards are practically free from any of the known active mosquito breeding grounds and although

There was always great difficulty in finding larvæ in wells. In the month of August, however, after a break in the rains, the wells became an active source of larvæ of *A. stephensi*. Until this date, very active well breeding had never before been recorded in Lucknow, although the 1913 report by Major Graham had laid down recommendations for these wells and had given a forecast that sooner or later an epidemic might result unless the wells were dealt with. In this epidemic, public wells were not to any extent of the same importance as domestic and private wells. Considerable difficulty was experienced in obtaining access to these latter wells owing to the strict purdah system prevailing in the city, and as there are 5,167 recorded wells (and many unrecorded private wells) the problem was of extreme difficulty. The epidemic would not have occurred if the recommendations laid down by Major Graham in 1913 had been carried out (*vide* appendix).

In this connection it is also interesting to note that of the 5,167 wells distributed all over the city there are as many as 1,392 wells in the Yahyaganj Ward. This ward gave a spleen rate of 49 per cent. and also showed the highest mortality from fever.

#### ANOPHELINE MOSQUITOES.

The following species of mosquitoes were classified and are shown in order of their prevalence—(April to September):—

Months.	Number of adult catch.	<i>A. subpictus</i> . (1)	<i>A. fuliginosus</i> . (2)	<i>A. culicifacies</i> . (3)	<i>A. stephensi</i> . (4)	REMARKS.
January ..	(207)	94%	4%	2%	0	(1) Non-carrier.
February ..	(189)	93%	3%	4%	0	(2) Doubtful carrier.
March ..	(314)	90%	6%	4%	0	(3) Efficient carrier of malarial parasites in mature.
April ..	(405)	91%	5%	4%	0	(4) Do.
May ..	(699)	86%	9%	5%	0	
June ..	(486)	89%	7%	4%	0	
July ..	(290)	92%	4%	1%	3%	
August ..	(704)	80%	5%	3%	12%	
September ..	(590)	85%	5%	2%	8%	

the wells were known to be potential breeding places, practically no breeding was found to be occurring in these before the month of August.

#### INFECTION IN MOSQUITOES.

The following table shows the numbers of mosquitoes dissected:—

	Number dissected.	Number found infected.	Percentage infected.	Mid gut.	Salivary glands.
<i>A. subpictus</i> ..	89	Nil	Nil	Nil	Nil
<i>A. fuliginosus</i> ..	78	Nil	Nil	Nil	Nil
<i>A. culicifacies</i> ...	60	Nil	Nil	Nil	5
<i>A. stephensi</i> ...	75	7	9.3	7	

From the above it will be seen that *A. stephensi* was the only species that could be incriminated in nature.

#### CONCLUSIONS.

The study of the present outbreak of fever in Lucknow has brought out the following important features:—

1. That a considerable proportion of the fever rise (April to September) was attributable to malaria.
2. That the epidemic of malaria broke out in the so-called "benign season"—the late spring. The months and the year preceding the outbreak were exceptionally dry.
3. That the epidemic of malaria was associated predominantly with benign tertian infections. The total percentage of infection found in cases was 61.9 per cent. Benign tertian infection formed two-thirds of these infections, and malignant tertian, quartan and mixed infections accounted for the remaining one-third.
4. That the intensity of infection was very severe. In about 50 per cent. of slides examined there were roughly 80 to 100 parasites per 200 red blood cells. In the other 50 per cent. the infection was also moderately severe.
5. That there were many cases of fatal abdominal malaria, typhoid remittent, and a few cerebral cases. Owing to the fact that most of the deaths took place outside the hospital and blood slides and post-mortems could not be obtained in any circumstances, the proportion of benign tertian and malignant tertian infections in fatal cases could not be estimated.
6. That the cases and deaths were mostly in the congested localities in the centre of the town, while the "mohallas" on the outskirts were not so badly affected.
7. That the wells (the potential breeding grounds) became most *prolific sources* of *A. stephensi* which was also incriminated infected in nature. That the Yahyaganj ward, which has the largest number of wells in the city suffered the most.

#### APPENDIX.

Recommendations by Major J. D. Graham, I.M.S., for the prevention of Malaria in Lucknow, (1913).

"It may be argued, and with reason, that as malaria is so mild in Lucknow city, no drastic measures are at present indicated. As, however, we have now strong reasons for believing that epidemic malaria originates under certain very favourable but unknown circumstances from existing endemic malaria, it is advisable to attempt to control, if not to eradicate, the existing sources of the disease. The problem is made easier by the fact that these have been shown to be comparatively circumscribed. Moreover, a very similar problem, thought on a very much larger scale, is now being solved in Bombay city where, as has been shown, certain

wards were very definitely affected by malaria carried by the *stephensi* mosquito which bred mainly in the wells, while other wards escaped almost entirely. We have to deal in Lucknow then with this condition on a small scale and with its possibilities as well....."

## A Mirror of Hospital Practice.

### A CASE OF ALKAPTONURIA.\*

By H. K. SINHA, M.B., B.S.,

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ALKAPTONURIA is an inborn error of metabolism in which the body is unable to deal with the constituents of the protein molecule called tryptophane. Its existence has been noted clinically for some centuries in Europe and less than 20 cases have been recorded so far.

Knowledge of the nature of the condition commenced in 1858 when Bodeker detected in the urine of a glycosuric patient a second reducing substance (not sugar), and on account of its behaviour to alkalis named it alkapton, a word derived from alkali and *λάπτειν*. Further investigations were carried by other investigators following Bodeker. Clinically the existence of the disease can be traced as far back as 1584. This case has been recorded as follows:—

S. M., aged 35, Mohammedan, male, married.

Occupation, cultivator. He was not a vegetarian. Living in Azamgarh District.

Complains of—

- (1) Urine getting black after some time, since childhood.
- (2) Painful micturition in hot weather, since childhood.
- (3) Blue deposits in external ear, palms and fingers, for 20 years.
- (4) Pain in the joints and tender spots and the body, for 5 years.
- (5) Swellings in the tendons, for 4 years.

*Family History.*—(Paternal family). None suffered from such disease. Father is alive and healthy.

(Maternal family.) No such complaint in any person in the family.

\* Sent by Dr. C. S. D. Misra, M.B., B.S. (Jaunpur) to the Department of Physiology.

Brothers and sisters. The patient had two twin sisters 4 years younger than himself. One of them had this sort of urinary disturbance, and died at the age of 17 from cough, fever and wasting. The younger had normal urine and died at 2 from cough, etc.

*Habits.*—Chews betel nut and tobacco.

*History of past illnesses and present.*—The patient says that his parents noticed that the wet clothes of their child used to turn dark after some time, and the washerman could not remove the stains. They got him and the mother treated by local *Vaidas* and *Hakeems* for several years without any result. Then they decided that the condition would not harm him and the treatment was given up.

At the age of 15 he noticed faint bluish deposits very deep under the skin of the palms and index fingers of both hands. They went on increasing till the present condition was reached.

At the age of 25 he went to Rangoon and was working there as a tea-seller and baker. About 6 years ago when he was at Rangoon he had an attack of fever which lasted for more than two weeks during which time he was not allowed to take any solid food. After his recovery one day while climbing stairs he felt something giving way in his left groin and there was pain. Since then he very often feels such sort of sensation and pain at various parts of his body in nearly all his joints and has got tender spots in his muscles.

About 4 years ago while running he felt a sharp pain in his left tendo achillis and the part became weak and swollen. It subsided after a month and a nodular swelling remained and the power of the part returned gradually. The same story was repeated with the right leg as well, about a year ago. Gives no venereal history and has never suffered from dysentery. No history of chronic arsenical poisoning or carbolic acid, either by the way of treatment or for other purposes.

*Physical examination.*—General. The patient is a young man of average intelligence and strong build. There are blue deposits in the cartilages of the pinna and on the lateral surfaces of the index fingers and thenar and hypothenar eminences. The epidermis is peeling off over the deposits of the fingers. The deposits are bilateral. He has got solid swellings over both tendo achillis. Epitrochlear glands are not enlarged.

Sites of pain. (On pressure and while walking.)

(a)  $\frac{1}{2}$  inch below the lateral malleoli (bilaterally).

(b) Lateral tuberosity of femur (bilaterally).

(c) Insertion of patellar tendon (bilaterally).

(d) Insertion of tendo achillis (bilaterally).

(e) Right lateral side of biceps femoris (muscular).

(f) Right posterior calf muscles.

(g) Right anterior inferior iliac spine.

(h) At the right side of the spinal region in the back just below the 12th rib. On pressure the pain shoots down the right buttocks up to the gluteal fold laterally.

(i) Medial condyle, right humerus.

Alimentary, circulatory, and respiratory systems are normal.

Reflexes and jerks are normal. Mentality seems to be slow.

Tender spots are present on his right tibial tuberosity.

*Urine.*—Reaction—Acid (to litmus, but was not sensitive to tripoclin).

The urine remained acid for 72 hours (litmus).

Colour—Deep brown.

Sp. Gravity—1032.

Deposits—None.

The urine becomes dark on exposure to the atmosphere after some time.

The black deposit on exposure to air was amorphous microscopically.

Sugar—Nil.

Albumin—Nil.

Bile—Nil.

With 20 per cent. KOH solution on heating it becomes dark.

The darkening of the urine interfered with the accuracy of observation of the reduction with Fehling.

On adding ferric chloride solution a bluish violet colour appears which fades quickly.

Shows presence of homogentistic acid in the urine.

My thanks are due to Dr. BurrIDGE, Head of the Department of Physiology, for permission to publish this article.

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# Indian Medical Gazette.

MARCH.

## ANTI-RABIC POLICY IN INDIA.

A SUBJECT which came up for discussion at the annual Conference of Medical Research Workers in December, 1929, in Calcutta, and which is of considerable interest to our readers is the future of anti-rabic policy in India.

Of recent years considerable work has been carried out at certain Pasteur Institutes in Central Europe on the use of an anti-rabic vaccine in which the virus has been attenuated by exposure to ether; this work culminating in the paper published by Alivisatos in 1922. The attention of workers in India having been drawn to this method, a very exhaustive trial of the method was carried out by Lieut.-Col. J. Cunningham, C.I.E., I.M.S., then Director of the Pasteur Institute, Kasauli, and his colleagues; the results being published in the *Indian Journal of Medical Research* from 1926 to 1928. This work may be summarised as follows:—

In their first paper Cunningham, Nicholas, and Lahiri (1926) found that death or very marked attenuation of the Kasauli fixed virus followed immersion of infected brains for periods of more than 36 hours in ether. After 84 hours' immersion the virus appeared to be non-viable in all cases, and the Kasauli virus appeared to be less resistant to ether than the viruses used by Remlinger (1919) and Alivisatos (1922). The virus in infected spinal cords was killed by 7 hours' exposure to ether vapour, and ether vapour appeared to have as marked an effect as immersion in liquid ether.

In their second paper, Cunningham, Nicholas and Lahiri (1927) studied the action of ether on street virus. This was found to be considerably more resistant than the Indian fixed virus, positive evidence of viability of the virus being found in the central portion of brains immersed in ether up to 72 hours. The action of ether vapour on street virus was less uniform and less rapid than its action on fixed virus. Results in general with Indian street virus corresponded to those reported by European observers. In their third paper, Cunningham, Nicholas and Lahiri (1928) report that living virus was found in spinal cords, infected with street virus, and immersed for periods up to 84 hours, but not in cords exposed to ether for 96 hours. In the case of exposure to ether vapour these periods have to be extended to 120 and 144 hours respectively. The virus in spinal cords is as resistant to the action of ether as is the virus in brain tissue. Later Cunningham, Nicholas and Lahiri (1928a) studied the fixed virus of the Pasteur Institute of Paris,

and found it considerably more resistant than the Indian fixed virus strain. Living virus was found in infected brains immersed for 144 hours, but not in brains immersed for 168 hours. In infected spinal cords the virus was found to be alive in the inner parts of the cords after 96 hours' immersion.

A new Indian fixed virus was now elaborated (Cunningham, Nicholas and Lahiri, 1928 b). This was found to conform closely in incubation period and time to death with the original Kasauli fixed virus first used in India. The virus remained alive in the interior of brains exposed for 84 hours to ether, and even possibly in brains exposed for 96 hours.

It becomes clear from this series of experiments that different strains of the rabies virus, both street and fixed virus strains, differ very considerably in their resistance to ether; that no definite period can be laid down which will be universally applicable; and that each strain of virus must be carefully tested before use.

A further study of the subject was next undertaken by Gloster, Beer, Nambiar and Sastry (1929). The authors conclude that carbolyzed vaccine in doses proportionate to those used for human beings confers considerable protection to guinea-pigs against subsequent infection with rabies; but that guinea-pigs and rabbits immunized with etherized fixed virus by Alivisatos' method show a higher degree of immunity than is obtainable by immunization with carbolyzed fixed virus, even when the latter is given in the same quantity for weight as the etherized fixed virus.

Alivisatos' method was next tested in India on man at the Kasauli Institute, and an abstract from Colonel Cunningham's report was read at the Research Workers' Conference. He reported that, although treatment with etherized vaccines did not abolish the mortality from hydrophobia among the treated, yet it brought about a very considerable reduction in the total and corrected mortality in the severest type of cases (Class IV, i.e., deep and uncauterised bites on bare skin). The most marked improvement was recorded in the face type of cases; the least in multiple bites involving both the face and other situations. He quotes the following figures for such cases:—

Total mortality rate, Alivisatos' method ..	4.88
" " " Hempt's method (use of two etherized vaccines of different strengths) ..	6.35
" " " Carbolyzed vaccine (1926, total brain substance up to 0.7 gm.) ..	8.62

Further, with Hempt's method, the period of treatment can be reduced from the normal 14 days to 6 days, without affecting its success. The improvement may be due to one or other of the four following factors:—

- (a) the use of living attenuated virus in the etherized vaccine;



- (b) the increased dose of brain substance;
- (c) the preliminary treatment of the brain substance with ether;
- (d) the use of massive doses at the beginning of treatment, followed by a gradual reduction until comparatively small doses are used;

and the influence of each of these factors has to be separately studied. Experiments on monkeys indicated that Alivisatos' method was superior to either Hempt's or to the use of carbolized vaccine, and that the antigenic value of the Paris fixed virus was greater than that of the Indian fixed virus.

Colonel Cunningham and Major Malone's final report, entitled "An investigation into the comparative values of carbolized vaccine and the etherized vaccines of Alivisatos and Hempt in anti-rabic treatment" was next circulated to all Directors of Pasteur Institutes in India for opinion and criticism. Whilst there was general agreement that results with Alivisatos' method might be better than with the existing carbolized vaccine, yet a general opinion was expressed that the use of a living, though etherized, vaccine might not be safe. Neuro-paralytic accidents are more frequent when a living vaccine is used. The better results with Alivisatos' method may simply be due to the fact that with it much larger doses of brain substance are given than in the present-day use of carbolized vaccine in India. A carbolized vaccine prepared from the Paris fixed virus might give as good results as Alivisatos' technique, whilst finally it was pointed out that Hempt has now abandoned the use of living virus, and uses a carbolized etherized vaccine. At the Pasteur Institute of Bengal, Captain E. C. R. Fox introduced the use of sheep's instead of rabbits' brains in 1926—in the first instance as a measure of economy, as a sheep's brain provides about six times as much vaccine as a rabbit's does. The results have been surprisingly and gratifyingly successful. After sheep's brain was introduced, the mortality in Class IV cases was as follows:—

1927. Class IV cases treated 954; mortality 2.83 per cent.

1928. Class IV cases treated 1,168; mortality 1.96 per cent.

as compared with Cunningham's figure of 4.88 per cent. in 819 Class IV cases treated at Kasauli by Alivisatos' method. The Calcutta 1928 cases indeed show more than 140 per cent. improvement over the Kasauli ones with the latter method, and appear to constitute the clearest and most unbiased evidence hitherto available in the literature as to the real value of anti-rabic vaccination.

This being the position when the all-India Medical Research Workers' Conference met in December last, the matter was referred at that meeting to a special committee, consisting of present and past Directors of Pasteur Institutes in India. The Committee's report was as follows:—

"1. A successful anti-rabic policy should be based on the following considerations:—

- (a) All persons at risk should have the opportunity of receiving anti-rabic treatment.
- (b) All persons at risk should receive treatment with the least possible delay.
- (c) All persons at risk should receive treatment adequate to the degree of risk involved.

2. To meet the above requirements the Committee put forward the following recommendations:—

- (a) In accordance with local requirements, decentralisation of treatment to subsidiary centres situated in convenient areas and in charge of an officer trained in anti-rabic work should be introduced.
- (b) The course of treatment used should be adjusted to the estimated degree of risk at the discretion of the Directors of Pasteur Institutes, and the same principles should be adopted at subsidiary centres where decentralisation is the policy.

- (c) On a consideration of the 'Report on the results of the Investigations into the Comparative Value of Carbolized and Etherized Vaccines in Anti-rabic Treatment carried out at Kasauli,' the Committee is not prepared to recommend any change in the type of vaccine at present, but considers that the results are in favour of the use of higher dosage of fixed virus and recommends that higher dosage than at present used be given where indicated.

The Committee does not feel itself in a position to bind Directors of Institutes to any fixed scheme of dosage, but considers that the experience in Kasauli of the safety and efficiency of higher dosage permits of its extended use within the limits so far tested.

- (d) More evidence should be collected as to the advisability of shortening the course of treatment in cases of minor degrees of risk, and Institutes should collect evidence on this point.

- (e) The collection of anti-rabic statistics should remain a function of the Provincial Institutes as at present regular returns of cases are being forwarded from the treatment centres. The same statistical card should be used for all Institutes in India and Burma and the sorting and tabulation should be carried out mechanically at one centre for all. A minimum of 80 per cent. of six-monthly health returns should be aimed at.

- (f) Adequate instruction of all officers in charge of treatment centres in anti-rabic work, particularly in the assessment of the degree of risk, the observation and care of patients undergoing anti-rabic

treatment, and the preparation of anti-rabic returns, are necessary.

- (g) Continued research on anti-rabic vaccine is required, not only in regard to type of vaccine (e.g., carbolized, etherized, formalinized), but also with regard to virus strains, their antigenic value, their maintenance, and the influence of the species of passage animal.
- (h) The method of disinfection of wounds, including the use of radiation, require further investigation."

It will be seen from the above summary that present-day anti-rabic policy in India is based on sound lines, but that further investigations are called for. The risks associated with the use of a living virus in Alivisatos' method appear to militate against its general introduction in India, whilst such an etherized vaccine could not be made available for general issue, as is the case with the present carbolized vaccine. The use of sheep's brains instead of rabbits' has proved very successful, both from the point of view of efficacy and economy. What seems to be most urgently called for, however, is an investigation of the antigenic value of different virus strains in India.

R. K.

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the utilization of occupation as an adjunct to other means of therapy has reached a point of development far in advance of that attained in any other country. Although occupational therapy had been in existence in the United States for one hundred and fifty years prior to the outbreak of the Great War, there is little doubt that one of the effects of that vast catastrophe was to stimulate interest in occupational therapy to a degree hitherto unknown, so that to-day no one in America regards occupational therapy as a fanciful theory of one or two eccentric medical men.

While occupational therapy has proved so far a claim to the best results with tuberculous, orthopedic and mental patients, its application to ordinary medical and surgical cases has been often highly beneficial.

Occupational therapy has had a number of synonyms, such as ergotherapy, work cure, moral treatment and diversional therapy; terms which are not free from objection because they place too much emphasis upon a single phase of a broad range of possible treatment.

In a discussion of occupational therapy for tuberculous patients for whom this type of treatment has reached the greatest degree of exactness of application, Dr. H. A. Pattison defines occupational therapy as "any activity, mental or physical, definitely prescribed and guided for the distinct purpose of contributing to and hastening recovery from injury or disease."

To all too many, occupational therapy signifies craft work and nothing more. This is unfortunate as craft work is merely one form of occupational therapy. A great variety of the activities of normal life, amusements, study, and occupations of various kinds, have been, and are being used under direction to promote recovery from physical or mental disability. When so used they are occupations, or occupational treatment.

As Dr. W. R. Dunton observes in his very useful little book, *Prescribing Occupational Therapy*, "occupational therapy, like much other human knowledge, depends for its advancement upon psychology." Unfortunately psychology has not yet determined with sufficient accuracy the physical and mental effects of the emotions upon the individual. While Cannon has produced a classic in his study of the physical effect of certain emotions, no one, so far, has been able to give an account of the converse. Nevertheless, empirical experience teaches us that if we can give a sick man an interest outside himself we shall make him more contented and happy and thereby aid in his recovery. Even with that class of patient who enjoys his invalidism or does not want to get well, it is possible, by a graded use of physical exercises, recreations and occupations to induce in him a better adjustment to life.

In circumstances such as these it is beyond dispute that every doctor should know something of the principles governing the application of

## SPECIAL ARTICLES.

### OCCUPATIONAL THERAPY.

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No one who has any knowledge of hospitals in the United States of America could deny that

occupational therapy in order to be able to prescribe it in an appropriate manner. In administering occupational therapy the physician should bear in mind the following points: (1) In applying occupational therapy, the treatment should be prescribed and administered under constant medical advice and supervision, and correlated with other treatment of the patient. (2) System and precision are usually as important as in other forms of treatment. (Dosage should be exact. The object to be attained should be kept in mind and treatment should not degenerate into mere diversion.) (3) The treatment should, in each case, be specifically directed to the needs of the individual patient. (4) As the patient's strength and capability increase, the type and extent of the occupation should be regulated and graded accordingly. (5) The only reliable measurement of the success of the treatment is the effect on the patient. (6) The occupation selected should be within the patient's estimated interests and capacity. (7) Though some patients do best alone, employment in groups is usually advisable, whenever possible, because it provides exercise in social adaptation and the stimulating influence of example and comment. (8) Inferior workmanship, or employment in an occupation which would be trivial for the healthy may be attended occasionally with the greatest benefit to the sick or injured; but standards entirely worthy of a normal person must, as a rule, be maintained for proper mental stimulation. (9) The production of a well made, useful, and attractive article, or the accomplishment of a useful task, requires healthy exercise of mind and body, gives the greatest satisfaction, and thus produces the most beneficial effects. (10) Novelty, variety, individuality, and utility of the product enhances the value of an occupation as a treatment measure. (11) Quality, quantity, and saleability of the products may, at times, prove beneficial by satisfying and stimulating the patient, but should never be permitted to obscure the main purpose of the treatment which, of course, is therapeutic.

We may now pass from the general consideration of occupational therapy as a therapeutic measure to a consideration of some of its special applications.

#### *For Tuberculous Patients.*

Occupational therapy for the tuberculous has been the subject of considerable research in America and the method of its application has been fairly well standardized. In treating this group of patients we have the advantage of objective signs in determining the dosage. A rise of temperature is an almost sure indication that the individual has done too much, but occupation should stop before this point is reached. It is essential, therefore, to watch patients carefully for early signs of fatigue. Although rest is of prime importance in the treatment of tuberculosis, too much emphasis may fall on muscular rest and

too little on mental rest. It is quite impossible for some temperaments to lie still and not become mentally restless. Dr. H. A. Pattison, in his *Treatment and Training of the Tuberculous*, cites an interesting example of the effect of occupation therapy on tuberculous patients. At the army tuberculosis sanatorium in New Haven, Conn., occupational therapy was tried in the ward containing the sickest white patients in the institution. "There was an almost immediate improvement in the symptoms and there was a marked improvement in the discipline and morale." Captain J. R. Byers, of the Canadian Medical Corps, states that he is firmly convinced that in the application of properly regulated work of an interesting nature in the treatment of pulmonary tuberculosis we have added a fourth word to our code which should read, rest, fresh air, good food, and work.

In prescribing occupational therapy for tuberculous patients, it is advisable to avoid all work which involves the extensor muscles of the arms and effort on the part of the trunk muscles. For such patients leather tooling and chip carving are considered among the most appropriate occupations. Pottery is also a very good occupation, while card colouring is both interesting and profitable.

In considering the special question of the possible danger of conveying infection through the handling of articles made by tuberculous patients, it is to be remembered that the instructions which every sanatorium gives and the hygienic precautions that such patients are taught to observe, render the liability to infection of articles handled by them very remote. To come down to a practical statement of the danger of infection with tuberculosis from clean patients employed in making articles for sale or use, it can be stated without fear of contradiction that the insignificance of the danger is comparable to that to which everyone is exposed in eating in a public restaurant or riding in a well-regulated public conveyance. However, to reassure purchasers or users of articles made by tuberculous patients, the following procedures are recommended.

Many textile articles will not be harmed by steaming, or by heat in a steam-jacketed steriliser. Failing this, pressing with a hot iron will effectually sterilise textile articles without injuring them. Basketry of various kinds, such as raffia, reed, wood splint, willow, etc., is used to a considerable extent in occupational therapy, and can be readily disinfected, if necessary. The qualification "if necessary" is made because the majority of baskets are finished by staining and varnishing, processes which would effectively kill any bacilli if, as is exceedingly unlikely, there were any on the articles. For baskets which are left in the natural finish, exposure to sunlight for a few hours without the intervention of glass between them and the sun will prove a complete germicide. Similarly with wood-work and leather.

*For Cardiac Patients.*

Many physicians would agree with the view that in no type of physical disease is the mental factor of so much importance in the recovery or rehabilitation of the patient as the cardiac, for hardly any other form of disease is associated with so much apprehension in the mind of the laity.

Occupational therapy for cardiacs may be divided into two classes: (1) for those with fair compensation and ability to do moderate exercise; (2) that which is more reconstructive and assists in carrying the patient through to wage earning and social living. In treating the first group extreme caution is imperative lest an overdose be given a patient in whose heart there exists decompensation. It should be remembered that cardiacs are notoriously difficult to gauge as to tolerance, so that prescriptions for occupations must be specific regarding the kind and amount of work. The patient must not be allowed to go beyond the limit allowed by his physician who is the only person capable of judging what this shall be.

*For Surgical Cases.*

With surgical cases there is as a rule proportionately less mental "let-down" than with medical. That is to say a smaller proportion of surgical cases are too sick to be benefited by occupation. We may divide surgical cases into two groups. First, those demanding immediate operation, as the injured and infected. Second, those in whom the operation may be deferred until the patient is in a proper physical and mental condition to undergo it. Examples, are chronic appendicitis, pelvic tumours, pelvic replacements and operations for deformities. Naturally the first group is not susceptible to any pre-operative occupational therapy. The latter group, however, may be greatly benefited by its application. In prescribing occupational therapy for surgical cases the choice of occupations will be governed by the type of injury or handicap which the patient has. It is impossible to lay down rules to cover all cases.

*For Mental Patients.*

In dealing with mental patients we are confronted with one of the most difficult problems of applying occupational therapy. Here the patients are "let-down" to a greater degree than in any other form of disease. Nevertheless, there is no other class of disability in which well-chosen and well-applied occupational therapy earns a better dividend. In the employment of occupational therapy many of the mental hospitals in England are lamentably behind the times and compare unfavourably with similar institutions in America. Indeed, in some of the mental hospitals in England occupational therapy as an organized therapeutic measure may be said hardly to exist. In the European Mental Hospital at Ranchi, occupational therapy has been the most

prominent feature of the various therapeutic measures employed there, ever since its inception in August 1923. To-day the organization and application of occupational therapy has reached a point at the Ranchi European Mental Hospital that has not yet been attained even in some of the best hospitals in America. There are various reasons to account for this, the principle of which is, in my opinion, that from the start we were fortunate in having the advice of Mrs. Eleanor Clarke Slagle, Director of Occupational Therapy for the State of New York. The vast experience and deep learning of Mrs. Slagle made it possible not only to avoid pitfalls in the beginning but to start the work on a proper basis. Then the Ranchi European Mental Hospital is fortunate in having ample accommodation for applying occupational therapy. To begin with there is a large central hall to which are attached annexes. In the main building the principal forms of occupational therapy are weaving, various kinds of needlework, knitting, boot-mending and making, drawing, raffia work, rug-making and producing books for the blind. In the annexes we have carpentry, basket-work, rug-making, sericulture, coir mat making and a blacksmith's shop.

In addition to treatment by graded and selected occupations, it is highly beneficial to place deteriorated patients under special habit-training instruction, whereby habits which are unpleasant or indecent are eliminated and more social behaviour substituted for them. To obtain success in this aspect of psychotherapy, there is need of the closest co-operation between all those who are concerned with the life of the patient. To arouse confidence and interest, to crowd out the old mental order of things is by no means an easy task. That it can be done is proven over and over again by the little stream of restored mental patients flowing back into the community with an adjusted outlook on life and social interests.

Work with mental patients naturally falls into distinct classes. The first being with the recoverable group, where every effort is concentrated upon a programme that will prevent deterioration and that will more quickly replace, by substitution, false ideas and beliefs by contact or interest in normal activities. The second class is that group where recovery may not be expected, and for whom active plans must be laid to utilize energy and productive ability in the hospital in which he in all likelihood will become a permanent member. The conservation of such mental capacity as may be possible is important in this group because we still may back our work effort with the hope that some cases are susceptible of great improvement.

The treatment by occupational therapy of patients suffering from nervous diseases requires the highest degree of individual attention and interest. Ingenious resourcefulness is taxed frequently in exacting sustained effort. Interest finally brings to the patient as well as to the

occupational therapist, the reward for faithful effort.

"It is difficult," writes Mrs. Slagle, "to invade the world of a mental patient and secure the co-operation necessary to produce results. Untiring patience, willingness to wait for the first faint glow and to know when the spark of attention is ready to burst into flame, is the duty of the occupational therapist. The ways and means of fanning the flame are manifold and, if the training or the occupational therapy has been adequate, he will know how best to help the physician in his work of restoration."

I would recommend those who are interested in this very fruitful manner of therapy to subscribe to the *Journal of Occupational Therapy and Rehabilitation*, the official organ of the American Association of Occupational Therapy, published bi-monthly by the Wilkins and Williams Company, Mount Royal and Guilford Avenue, Baltimore, Maryland, U. S. A. In this journal is an immense amount of information on every conceivable aspect of occupational therapy, from a practical as well as from a theoretical standpoint.

#### AN EARLY PIONEER ON THE STUDY OF INDIAN MALARIA.

By R. SENIOR-WHITE, F.R.S.E.,  
Malariologist, Bengal-Nagpur Railway.

THROUGH the kindness of Mr. J. Van Manen, General Secretary of the Asiatic Society of Bengal, I have had my attention drawn to a most interesting old volume unearthed from the Society's library, entitled "Report on Fever," by Assistant Surgeon William Geddes, "published by Authority of Government, under the Inspection of the Medical Board," and dated Madras, 1827. It embodies the clinical observations of a keen observer, working over one hundred years ago at Seringapatam and Cuddapah, on regimental duties.

The 1st Battalion of the 11th N. I. arrived at Seringapatam in April 1823, and remained there for nearly a year. It had previously been stationed at Ellore for 18 months, and before that at Nagpur, in both of which stations the battalion had enjoyed good health. In spite of the fact that to reach Ellore it must have marched *via* the now defunct military road from Kamptee to Vizianagram, traces of which, such as an occasional milestone in the forest with "Raipur" still legible, or the mango topes and earthworks of camping grounds and forts, as at Ambadola, Rayagada and Asurgahr, still remain. This is the most notoriously unhealthy country in India, and though they apparently travelled through it about October 1821, whilst at Ellore the battalion had a low fever incidence, averaging only 22 cases per month on an average strength, excluding officers, of 1,119. On transfer to Seringapatam the fever incidence rose to 136 per month, or six times the Ellore rate. This works

out at 1,340 per mille per annum, as compared with 44.8 in the Bangalore brigade to-day, but of course the Fort of Seringapatam is no longer garrisoned.

The clinical thermometer had apparently not then come into existence,\* and the author bases his observations on pulse rates plus simple statements of high fever or otherwise. He divides his cases into no less than eleven types, as under:—

Remittent	quotidian
"	tertian
"	ephemera
"	irregular
"	double tertian
Intermittent	quotidian
"	tertian
"	quartan
"	double tertian
"	ephemera
"	double quartan.

In addition the author deals with what he states may be styled a "double quintan," which he shows is really only a single tertian that is "anticipating," and elsewhere notes the particular tendency of this form to do this. The author's definition of an "intermission" is that the pulse should have come down below 72, the skin be perfectly cool and moist, and that there be little or no headache. From this it is easy to understand that this corresponds with the "apyrexial interval" of to-day, and that by a "remission" would be meant only a drop in the temperature chart.

Even faced with a quotidian fever, the author, to use modern terms, had in his own mind succeeded in distinguishing the species of causative parasite.

A quotidian occurring in the morning, he states, almost always turns out to be a double tertian. Even though the initial attacks occurred in the afternoon, a morning periodicity was later established. Quartan was, throughout, without a single exception in 44 frank cases of this disease, an afternoon fever. He notes that most quartans showed a quotidian periodicity in some part of their course. [There appears to be a *lapsus calami* on the first line of page 50. Unless here "quartan" be read for "tertian" the sentence does not make sense. The author states that the report has been greatly delayed by attacks of the disease he was himself investigating.] As a quotidian is thus distinguished from a double tertian, it becomes apparent that the former must have been in the main what we call to-day malignant tertian. Assuming this to be the case, we are left with the "ephemera" and "irregular" classifications to elucidate. The syndrome described on pages 18 to 19 would appear to be at least in part bacillary dysentery,

\* The clinical thermometer was introduced into medicine some forty years ago by the late Sir Clifford Allbutt.—  
EDITOR, I. M. G.

that described on page 32 dengue or tick-typus. It is impossible to speculate with any certainty on the ætiology of these two classifications, and it will be safer to refer them to causes other than the plasmodia. Then from Table XII we may classify the parasitology of Seringapatam malaria as follows for the 1,503 cases listed in the table.

	Remittent.	Intermittent.	Total.
<i>P. vivax</i> .. ..	117	191	
double infection ..	56	..	364 = 32 per cent.
<i>P. malariae</i> .. ..	..	36	
double infection ..	..	8	44 = 4 "
<i>P. falciparum</i> ..	469	253	722 = 64 "
		1,130	

The balance being regarded as non-malarial fevers.

Further parasitological information can be expected from the tables. By combining Tables VII and VIII, and using the above parasite differentiation, we get—

	PRIMARY ATTACKS.
	Benign tertian. Malignant tertian.
May .. ..	18 40
June .. ..	17 38
July .. ..	16 17
August .. ..	11 29
September ..	18 41
October .. ..	14 47
November ..	16 58
December ..	13 34
January .. ..	17 18
February ..	9 16
March .. ..	2 5

We here obtain corroboration of an attempt to express the author's classification in modern terms by seeing *P. vivax* maxima in May and September (the "spring" and "early autumn" rises) with a late *P. falciparum* maximum in November, (exactly what one would expect). The winter prevalence of quartan is seen in Table I, where 17 out of 27 recorded relapse cases of quartan occurred in January and February.

Now we have detailed information as to the parasitology of malaria at the Experimental Station at Nagenhalli, within two miles of Seringapatam (Knowles and Senior-White\*), but only in children, not in adults, and it is known that quartan is peculiarly a disease of childhood. The Nagenhalli figures are *P. vivax* 53.5 per cent.; *P. malariae* 32.0 per cent.; *P. falciparum* 14.5 per cent.

Turning to the symptomatology, the author twice emphasizes the factor of constipation in precipitating an attack, whilst on page 20 he deals with the relationship of menstruation to relapse, a matter regarding which Lieut.-Col. R. Knowles and the present author, in another paper, have recently failed to obtain any definite information from their gynæcological brethren in Calcutta to-day. According to Dr. Geddes, however, "the

most frequent period of relapse is shortly before the occurrence of this discharge, and in one instance, the crisis on two attacks appeared to take place on the supervision of the menses, on each occasion four days previous to their regular period." One of the most extraordinary features of the report, however, is the very slight mention made throughout of splenic enlargement. The author deals with the point on page 29, and states that only on a few occasions has he encountered even perisplenitis, in a few more he encountered a "P. I." spleen, but "in one or two individuals also, a complete ague cake could be felt, and these were remarkable as not being in the situation of the spleen, but immediately under the integuments, below the margin of the ribs and considerably nearer the linea alba than the natural position of this organ, these cases, however, were very rare....." Now with few exceptions, the Seringapatam cases were not treated with quinine, and the fever only ceased by the development of partial tolerance or increasing resistance. How then was it that so little splenic enlargement was encountered? No less than 45 out of 748 original cases had four or more relapses (Table II), and surely at least these 45 would have shown the author splenic enlargement. The author notes that usually the "crisis" was reached after the third paroxysm.

James' recent observations on the irregularity of initial attacks made in connection with G. P. I. treatment were anticipated by Geddes, particularly in respect of quartan. "The quartan period seldom occurred distinctly from the commencement of the disease.....it more generally was observed after several irregular paroxysms, and occurring at all hours—chiefly of the quotidian type, but sometimes of the tertian, and in these the tertian paroxysms were generally observed at the hour of quartan.....whilst the quotidian accessions were very infrequently in the forenoon; with these was occasionally blended a quartan interval, and after a few of these irregularities, the disease puts on its regular quartan type, with all its obstinacy in resisting the means used for its removal." He notes that only 3 out of 36 fresh quartan infections were frankly quartan from their onset, whilst he further anticipates James' observations on multiple infections made with *P. vivax*, that double infections of quartan tend to later become single.

A curious line of enquiry prescribed by the author, arising from local lay beliefs in old European residents of "Mysore and Seringapatam," is the relationship of relapses to the phases of the moon, and in Table IV he presents some definite evidence that incidence is highest on the 15th of the lunar cycle. He is distinctly sceptical as to whether there is anything in the hypothesis, the more so as he found that native beliefs took no account of the phenomenon, but there is all the material for a nearly regular curve in Table IV!

In discussing the course of fever, the author's observations are interesting. He notes, for

\* In Press.



Mysore, a relationship with jungle and elevation. He states that for Seringapatam no sufficient cause of its malariousness can be discovered, as elsewhere he has met, with a river bed and adjacent paddy fields without producing conditions of such extreme unhealthiness—and we would urge on the Malaria Section of the Mysore Health Department an investigation into the accuracy of these statements, having regard to old maps of the Cauvery irrigation system in the vicinity as well as conditions to-day. He notes that the most unhealthy periods coincide with east winds. This may merely mean the north-east monsoon in the usual autumnal "fever season," or it may mean a wind-borne influx of mosquitoes from the irrigation area of Nagenhalli, if such existed in 1823. The upward leap in spleen rates as this area was entered along the Bangalore-Mysore road was demonstrated to the writer by Dr. Sweet a year ago.

At the end of his year with the 11th N. I. the author was transferred to Cuddapah, where he apparently became a sort of Assistant Civil Surgeon, being also in medical charge of the "1st Extra Regiment," and the jail. Here he encountered a type of disease that he did not meet with at Seringapatam, to wit "typhoid remittent," and it appears that it is to Geddes that medicine is indebted for the term, as after describing it he states, "I conceive that the term typhoid remittent may be properly applied to it." He then gives a clear account of cerebral malignant tertian, terminating fatally. He notes how these patients had frequently attempted to carry on duty whilst sick for several days after being attacked. He also notes visceral malignant tertian with choleraic symptoms. However, Geddes was apparently not clear about the distinction of this form of malignant tertian from heat stroke.

Perhaps the most interesting aspect of the book, however, is the details it contains regarding treatment. This was the period of calomel as the standard remedy for malaria, as detailed in Knowles and Senior-White's *Malaria*, page 89. The author's earlier period at Seringapatam shows him in possession of cinchona bark powder only, and not altogether enamoured of it; the Cuddapah period shows him in possession of quinine sulphate, albeit apparently in very limited quantities, and enthusiastic about its use. He writes, ".....the foetid, ulcerated and often bleeding mouth caused by this medicine, the protracted convalescence in consequence, the frequent affections of the bowels by the calomel and perhaps the tendency to relapses excited by it, have all made me very reluctant, latterly, to make use of mercury.....my opinion in regard to this medicine in fever is as follows; that in intermittents and chronic remittents it may always be superseded by the sulphate of quina where procurable, or in most cases by the pulv. cinchonæ; in remittents, when mild and critical.....it is not necessary; in typhoid and other more violent remittent, the sulphate of quinine is much more

likely to be successful, and in short, that the use of mercury to salivate a feverish patient..... must in every instance be considered as an acknowledgment that our other more powerful means are not available."

Geddes arrived at this conclusion from cases such as the following, which vividly illustrate the horrors to which the unfortunate malaria patient was subjected a century ago. This particular case was not Geddes', but was under J. Bell, Assistant Surgeon, 42nd Regiment N. I., at Ghooty.

"Febris Biliosa Remittents.

"Henry Marshall, Ensign, Aetat, 17.  
Six months resident in India."

4th January, 1827.—The patient was attacked suddenly. He came to hospital as soon as the attack commenced, after rigors lasting an hour.

"Pulse 84, skin hot and dry; tongue white, bowels regular." In spite of the last case note, the unfortunate youth was immediately placed on the following:—

℞  
Mag. Sulph. .. .. ʒls.  
Antim. Tartrate .. .. gr. iv.  
Every two hours.

℞  
Hydrarg. Submur. .. .. gr. xij.  
Pulv. Jacobi .. .. gr. iv.  
Opīi .. .. gr. j.  
Bolus at bed time.

℞  
Inf. Sennæ .. .. ʒii.  
Mag. Sulph. .. .. ʒiv.  
Extr. Colocynth .. .. gr. vi.  
Aq. Ment. .. .. ʒi.  
Haustus cras mane cap.

5th January.—"He slept well and perspired profusely during the night. The medicines operated freely, bringing away several copious dark coloured stools. Pulse 80, soft and compressible, tongue white in centre." In the afternoon he had another rigor, followed by a pulse of 108, with all the symptoms of acute pyrexia. He then got "Venæ Sectio ad ʒxxiv. Rept. Bolus Hydrarg. Submur. c Pulvere Jacobi et Opio hora Somni et Haustus Purgans cras mane. Contr. Mistura ex Magnes. Sulph. et Antim. Tart."

6th January.—"He was much relieved by the bleeding, and slept well during the night. He had two copious dark coloured stools from the medicines, pulse 96, sharp, tongue dry, white and excited, skin hot with slight moisture on the forehead and upper hip, urine high coloured and scanty, moans deeply at times."

In the evening, there was a great exacerbation, pulse 120, and a complaint of violent pains in the head, etc. He therefore got "Venæ Sectio ad ʒxxiv. Contr. Mistura ex Magnes. Sulph. et Antim. Tart. Rept. Bolus Hydrarg. Submur. c Pulvere Jacobi et Opio et Haustus Purgans ut Antea."

7th January.—The morning case notes of 6th January are repeated almost verbatim, except that thirst was noted as less urgent, but in the evening there was a further paroxysm, pulse 120, with stupor.

"Hirudines xxiv statim Temporibus.

Rept. Bolus et Haustus Purgans ut Antea.

Contr. Mistura ex Magnes. Sulph. et Antim. Tart."

8th January.—"The leeches afforded great relief, he had several dark watery and foetid stools from the medicines, pulse 120, tongue dry, and covered with a dark fur, skin very hot and of a deep yellow tinge. He moans very frequently, there was a slight remission of fever at 12 o'clock noon, when the pulse fell to 100, and there was slight moisture in the forehead and upper lip; this was succeeded by an exacerbation of symptoms, he became restless and irritable, thirst very urgent, burning heat of skin, occasional aberrations of mind, urine high coloured, scanty, and passed with such difficulty as to require fomentations to make it flow.

Contr. Mistura ex Magnes. Sulph. et Antim. Tart.

Rept. Bolus hora Somni. et cras mane."

9th January.—He continued in much the same state all day, pulse during fever 125, during remission 100, tongue quite dry, with dark fur, deep red at point and edges. Semi-delirious.

As he apparently was considered to have not even yet taken enough mercury, he now received:

"Contr. Mistura ex Magnes. Sulph. et Antim. Tart.

Rept. Bolus bis in die. Frictiones ex unguent. Hydrarg. zj. in die."

10th January.—In the same state. Same remedies, including the mercury inunction.

11th January.—"No alteration for the better, pulse 130, skin hot and of a deep yellow colour, tongue quite dry and covered with a dark chocolate coloured fur, and when touched it feels as rough as a nutmeg grater, urine scanty and passed with difficulty, stools frequent, watery, dark and very foetid."

Quinine was now apparently exhibited as a last resort.

"R Quinine Sulph. gr. xij. Micæ panis aquæ aa qs. ut. ft. pilul. xij. quarum, Sumat unam ad remissionem febris, et repetatur aquaque hora febre absente."

The pills had the desired effect of bringing on an intermission of fever. The pulse fell to 98, and all the symptoms were relieved....."

"Omitr. Bolus et Frictiones ex unguento Hydrargyri.

Rept. Mistura ex Magnes. Sulph. et Aatim. Tart. ad accessionem Febris."\*

12th January.—A very violent paroxysm occurred, with full delirium of a maniacal nature. Towards daybreak he fell into a torpor, pulse

135, with a remission to 108 and slight lowering of temperature at 8 a.m.

"Sumat Pilulas Quinæ Sulphates tres ad remissionem febris, et postea duas quaque hora febre absente.

Rept. Mistura Magnes. Sulph. et Antim. Tart. ad accessionem febris."

The pills again acted like a charm. Pulse down to 96, skin cool and suffused with gentle perspiration. "He complains that his gums are swelled and very tender—his bowels were twice opened, stools contain healthy bile and are less foetid. He is excessively reduced and so much exhausted as to be unable to move in his bed without assistance."

13th January.—No return of fever. Mouth very sore, ptyalism commenced. [The author has elsewhere noted that mercurial symptoms usually hold off until the fever has broken.] Quinine continued.

14th January.—No return of fever. "Ptyalism is very severe and he has much difficulty in opening his mouth owing to pain and swelling of the glands under the jaw." Quinine continued.

From this date he gradually improved, but relapsed,† with tertian intermittent on 12th February, when almost well, "in consequence of exposing himself to the sun." This again yielded to quinine, of which he received 92 grains in four days. It is noted that 24 grains of quinine sulphas. entirely removed the attack of tertian intermittent.

The case is completely by a note by the Medical Board at Madras, who appear impressed but not convinced. It is followed by a very similar but much less severe case where quinine nearly failed, as noted by the Board, owing to its being exhibited in totally insufficient quantities by a Surgeon Stephenson of the 2nd Light Cavalry, who ordered only gr. ijs. t.i.d., later changed to gr. iij. b.i.d., the fever continuing for about three weeks under this regimen.

Surgeon Stephenson finally forwarded a report on quinine to the Superintending Surgeon, Hyderabad Subsidiary Force, protesting against the Medical Board's order to exhibit it at the rate of gr. xx. a day. This note is dated 4. xi. 22, whereas the note of scepticism on "Henry" Marshall's case is dated 19. iii. 27, so we may deduce that it was in the year 1827 that the Medical Board became convinced of the value of quinine in malaria. It must have been due to the acute observations of men like Geddes and Bell that this radical change-over in medication occurred, and the fact that other officers' cases are appended to Geddes' book shows how highly he must have ranked in his day as a malariologist. Seventy years before his great successor in the same Service and Province, he must, to have

\* Total amount of mercury exhibited to this date: by the mouth 108 grains, by inunction, 5iii.

† Was this a relapse, or a benign tertian infection? If the former, then it throws great doubt on the possibility of separating the two tertians other than by microscopical methods, and vitiates the whole argument on p. 161.

accumulated the observations here summarized, have imitated him.

"I pace and pace, and note down all I see,  
Lest some dim distant light may haply break."

Can anyone in the Surgeon-General's office in Madras discover the ultimate fate of this pioneer malariologist, and if, as is probable, he left his bones in India, where he lies?

## Medical News.

### A BILL TO ESTABLISH AN ALL-INDIA MEDICAL COUNCIL.

As our readers are aware, the present position with regard to the relationship of the Indian universities to the General Medical Council of Great Britain has reached a serious *impasse*. In 1926, Dr. U. Rama Rau of Madras introduced a Bill "to regulate medical education in India" in the Council of State. As, however, Government were convinced of the imminent need for setting up in India a central organisation to regulate the standards of medical qualifications, this Bill was dropped in favour of the official proposals. The attempt on the part of Government to introduce its own Bill in the Legislative Assembly, however, proved abortive, as unexpected opposition was encountered, chiefly from Provincial Ministers, who appeared to be afraid that the proposed central organisation might override and usurp the functions of the provincial Medical Councils. The General Medical Council then proposed that a Commissioner of Medical Qualifications for all-India should be appointed, who would do the necessary inspection work on their behalf, and report as to whether or not the term of recognition of the Indian medical degrees should be extended. This proposal was vetoed by the Legislative Assembly.

As a result, the present position is that recognition of the Indian medical degrees by the General Medical Council of Great Britain only holds until the next meeting of that Council (February, 1930), when the whole subject is to be discussed.

We can understand opposition to the proposal for a Commissioner of Medical Qualifications, though we consider such opposition to be unsound. From the point of view of the General Medical Council, it is absolutely essential that the standard of examination shall be a sufficiently high one, and not even the degrees of the British universities would be granted recognition if the Council were not satisfied that this was the case. On the other hand, the trend of present-day opinion in India is against the increase of officialism, and such a Commissioner cannot by any stretch of the imagination be regarded as a democratic institution.

Opposition to an all-India Council is less easy to understand. There does not appear to be any real danger that such a Council would override the provincial ones. With Medicine a transferred subject, the provincial councils are in a fairly strong position. We believe that there is a consensus of opinion, both among the medical profession in India and amongst the lay public, as to the need for such a Council, whilst its creation would once and for all meet the requirements of the General Medical Council of Great Britain. It would give India self-government in medical education, together with reciprocity with Great Britain.

It seems doubtful at the present moment whether Government will re-introduce the Bill for an all-India Medical Council in the Assembly, but some action must be taken to meet the situation which has arisen.

Under these circumstances Dr. Rama Rau hopes to re-introduce a Bill for this purpose, modified from his former proposals to meet the criticisms which the former proposal evoked.

The purposes of such an all-India Council in the Bill are defined as follows:—

(1) The establishment throughout British India of a uniform and satisfactory standard of medical education and examination.

(2) To establish an all-India medical register of qualified medical practitioners.

(3) To determine the qualifications necessary for enrolment on the register.

(4) To scrutinise and approve of the courses of medical study and examination by different institutions, and to inspect their examinations.

(5) To attain a status for the medical profession in India which will ensure recognition of its members in the United Kingdom and elsewhere, and secure reciprocal rights of medical registration.

(6) To regulate the conditions under which persons qualified to practise in the United Kingdom and elsewhere may be admitted to the all-India register.

The composition proposed for the Council is as follows:—

(1) The President, in the first instance, to be nominated by the Governor-General in Council; thereafter to be elected by vote of the members of the Council.

(2) One member elected by each university established in British India by an Act and having a medical faculty.

(3) One member from each province elected by private practitioners who are graduates of a recognised Indian university.

(4) One member from each province elected by private practitioners who are on the provincial register, and who hold qualifications other than (3) above.

(5) One member from each province to be nominated by the Governor-General in Council.

The usual term of office of the president and members to be normally four years.

The usual definition of the rights and privileges of medical practitioners on the proposed all-India register are then defined, and follow upon the usual lines, e.g., certificates from any persons not on the register shall not be valid in law, and appointments to official posts shall be confined to those on the all-India register. Finally, similar powers are proposed for the all-India Council with regard to erasure of names of persons guilty of improper conduct in a professional sense from the register, as are in force under the General Medical Council of Great Britain. The right of appeal, whether in person or by counsel, however, is retained.

On a study of Dr. Rau's Bill, our opinion is that it appears to meet the present conditions admirably. It meets the Indian demand for self-government in medical affairs by the creation of an all-India body of democratic constitution, to whom the General Medical Council of Great Britain may be expected to entrust the duties of supervision of medical education and inspection of examinations; whilst it does away with the necessity for an official Commissioner of medical education, appointed *ad hoc* without consulting general medical professional opinion in India. The one direction in which opposition to the Bill is likely to develop appears to be the suggestion that the all-India Council may override the provincial Medical Councils. We believe that this danger is more apparent than real. Normally, the right of inspection of medical study and examinations would be exercised, but we doubt whether the right of erasure of names from the medical register would be exercised, except with regard to the names of persons reported to have been erased from the provincial medical registers. Undoubtedly the proposal for an all-India Council suggests a duplication of functions by a central all-India body and by the provincial councils, but in actual practice we doubt whether difficulties would arise. On the other hand, the medical profession in India would gain immensely by the creation of a democratic all-India Council which would be an intermediary between itself and the General Medical Council of the United Kingdom, and would ensure uniformity in the different provinces in India, and between them and other medical councils in the British Empire and other countries. In brief, the Bill

attempts a sort of Federal solution of the present problem, which would leave the powers of the existing provincial councils untouched, but yet introduce a central and co-ordinating mechanism which would give India combined representation with regard to world problems of medical education and registration.

We have no doubt that the proposed Bill may be considerably modified when it actually comes to be discussed; but it, or some such similar Bill, appears to be absolutely essential to meet the necessities of the present situation.

#### THE NEW YEAR HONOURS, INDIA, 1930.

The following were the New Year Honours conferred on 1st January, 1930, on medical workers in India, whose recipients we beg to congratulate.

##### C. B.

Colonel A. B. Fry, C.I.E., D.S.O., M.D., V.H.S., I.M.S.

##### C. I. E.

Colonel W. V. Coppinger, D.S.O., M.D., F.R.C.S.I., I.M.S., Inspector-General of Civil Hospitals, Central Provinces.

Lieut.-Colonel A. F. Hamilton, M.B., F.R.C.S., I.M.S., Professor of Midwifery, Grant Medical College, Bombay.

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#### KAISAR-I-HIND MEDAL.

##### (1st Class.)

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Mr. Aya Ram, Sub-Assistant Surgeon in-charge, Kyaukme and Sakantha Dispensaries, Hsipaw State, Northern Shan States, Burma.

Babu Shiva Prashad, Sub-Assistant Surgeon, Bihar and Orissa.

Bo T. Kazi, Sub-Assistant Surgeon, Gyantse, Sikkim.  
Subadar Major A. P. Misir, I.M.D., Senior Sub-Assistant Surgeon.

#### RAO SAHIB.

S. M. Khedkar, Subordinate Medical Service Sholapur District, Bombay Presidency.

#### THE 37TH CHEMISTS' EXHIBITION.

THIS Exhibition, organised by the *British and Colonial Pharmacist*, was established in 1896 in London, and there is nothing approaching it in size and comprehensiveness held anywhere else in the world. It was organised to give the practising pharmacist an opportunity every year of seeing, under one roof, all the goods he sells and the various apparatus, utensils and other requisites he uses in his profession. The management is always delighted to welcome visitors from the Dominions and Colonies, and such gentlemen will be admitted on presentation of business card. The Exhibition has grown continuously, and this year will be housed from 26th to 30th May, in the handsome new Hall of The Royal Horticultural Society, Westminster, S.W., in the very heart of London, practically under the shadow of the Houses of Parliament and Westminster Abbey.

#### THE BRITISH COLLEGE OF OBSTETRICIANS AND GYNÆCOLOGISTS.

Lieut.-Col. V. B. Green-Armytage, M.R.C.S. (Eng.), L.R.C.P. (Lond.), M.B., Ch.B. (Bristol), M.D. (Bristol), F.R.C.P. (Lond.), I.M.S., Professor of Obstetrics and Gynaecology and Surgeon of the Eden Hospital, Calcutta Medical College, has been elected a Foundation Fellow of the British College of Obstetricians and Gynaecologists. Our readers will join us in our congratulations to him on so well deserved an honour, which is not only a personal one, but also a tribute to the Indian Medical Service, and to the work done at the Eden Hospital, Calcutta.

## Current Topics.

### Remarks on the Symptoms and Diagnosis of Placenta Prævia: with a Note on the Use of Submammary Saline.

By BETHEL SOLOMONS, M.D., F.R.C.P.I., M.R.I.A.

(*The Brit. Med. Journ.*, September 21st, 1929.)

1. THE most likely reason for separation is that the painless contractions of Braxton Hicks, which continue during the whole pregnancy, cause a passive dilatation of a lower segment which is softer and more dilatable than normal; during the later months of pregnancy the placenta does not expand with it and must therefore become detached.

2. Disease of the placenta may occasionally be a causal factor from faulty adherence, and it is a well-known fact that the placenta may be diseased.

3. The capsular development of the placenta may prevent the attachment being as firm as usual.

Hand-in-hand with these theories are: (1) the opened placental site sinuses pouring out blood after separation; (2) hæmorrhage occurring from the circular sinus and the intervillous spaces of the placenta.

These are the most plausible of the many theories suggested.

#### ÆTIOLOGY.

The most valuable factor in considering ætiology is to determine if the knowledge will assist in diagnosis or prevention. The following theories must be mentioned:—

1. The basal implantation theory. That the ovum after fertilization is inserted in the lower uterine segment.

The placenta is basal and the clinical result is a central placenta prævia.

2. The capsularis implantation theory. That the placenta is developed in connection with the decidua capsularis as well as with the decidua basalis. This variety determines a lateral or partial placenta.

3. Defective vascularity of the decidua may make it necessary for the placenta to spread over a large area for nourishment.

4. Inflammatory or atrophic changes may be explained in a similar manner.

5. The placenta membranacea may invade the lower segment because of its size.

These are the theories which are really worth considering and they bear out the one great theory that there is some fault in the endometrium—a true endometritis or else a hyperplastic condition, and that this may account for the abnormality. We have several times in our practice curetted the uterus two months after the occurrence of placenta prævia and have obtained the above findings. Following the growth of healthy endometrium, confinements have been normal. In other words, in the basal theory the ovum seeks healthy endometrium; in the capsularis theory the ovum must spread. There is no need to explain further the other possibilities. While we are not at all wholesale advocates of the curette, we believe it to be entirely indicated two months after a placenta prævia labour when the uterus has regained its pre-pregnancy tone, and that by so doing placenta prævia in future pregnancies will be avoided.

#### THE DANGERS OF PLACENTA PRÆVIA.

These, according to world statistics, are great for the mother and very great for the child. The mother may die from collapse following on hæmorrhage, from which, if she recovers, she is so desanguinated that sepsis of a fatal nature may occur. Sepsis may also occur because of the low position of the placental sinuses. It is scarcely necessary to mention that sequelæ such as menorrhagia, tendency to abort, and sterility are numerous. In addition, rupture of the cervix because of its sodden condition is said to be common.

The foetal mortality is enormous. Prematurity with a 50 per cent. death rate in the first month is the rule and this fact must be carefully borne in mind when dealing with diagnosis with a view to treatment. Death during its passage through the birth canal is common for the infant because of interference with its oxygen supply through the placenta, or else from prolapse of the cord.

The possibility of the occurrence of placenta prævia is made very evident when it is stated that in a search of the records of the Rotunda Hospital it was found that there were 326 cases among 60,130 deliveries—that is, an incidence of 1 in 183. This incidence makes very apparent the necessity for knowledge of the subject by every general practitioner. Among these cases there were 19 deaths, a death incidence of 1 in 17. This mortality rate is far too high, and with improved technique in diagnosis and treatment, I am able to report a series of 55 consecutive cases since the commencement of my Mastership without mortality. Most of the babies were premature and only 12 were born alive; 2 died before leaving the hospital, so that the prognosis for the infant is extremely bad. These statistics show clearly the necessity for deep thought when deciding on treatment of a given case.

#### DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.

The occurrence of placenta prævia may be suspected in pregnancy by the history of hæmorrhages at various times. A perusal of the case sheets of the hospital reveals in many instances a history of hæmorrhage occurring at intervals varying from the fourth month onwards. This point may be of value, for placenta prævia may be suspected, and the patient should be kept at rest, when it may be found possible to carry her on in her pregnancy until the child is well viable.

A history of previous abortions or miscarriages is sometimes elicited, but this history has been obtained so

seldom that it has but slight, if any, significance. It has been suggested that, as the patient is usually multiparous, something might be elicited from the previous labours; no such facts could be made out. On the contrary, with the exception of abortions, the previous labours had, as a rule, been without incident. Repeated toxæmias are common; placenta prævia seldom occurs more than once in a woman's life. We have little or nothing to warn us of the possibility of placenta prævia. In its silence lies danger. How, then, can we diagnose the condition? The first symptom to which our attention is drawn is fresh hæmorrhage accompanied by clots. This is a most important point in diagnosis; the bleeding is extremely insidious in its onset; it may occur in sleep; it may happen while the patient is sitting talking to her friends; it may be slight and may recur, or the first hæmorrhage may be so severe as to cause marked constitutional symptoms, even to the extent of a fatal issue. We have met with patients whose pulse was 80 and strong one moment, and who soon after were pulseless. The bleedings are entirely unaccompanied by pain. This severe type speaks for itself and tells us the diagnosis; the patient who has recurrent attacks of slight hæmorrhage is more difficult, but her case must be diagnosed as soon as possible, for a slight first hæmorrhage does not mean that the next will not kill her. In fact, generally speaking, definite diagnosis is essential; a "wait and see" policy may mean a fatal result. The infant is usually premature to some extent. A study of the records revealed the fact that there was no special week more favoured than another. At any period from twenty-eight to forty weeks the hæmorrhage may commence.

Following the hæmorrhage, two pints of submammary saline are given under the breasts. As this takes place during the diagnosis it must be mentioned here, even though it is a part (and a most important part) of the treatment. All practitioners should carry in their maternity bag apparatus for giving submammary saline; it is the most practical method of making up for the blood lost—in the hands of the ordinary general practitioner—and it is entirely effective. Since I have adopted this prophylactic saline method at the Rotunda I have not lost a single case. People may speak of blood transfusion and venous medication, but in the emergency practice of the general practitioner a combination is necessary which is simple, safe, and effective. Once the saline is started, its administration should, if possible, be left to an assistant. At the Rotunda the saline is prepared as follows: one pint of water is boiled with two teaspoonfuls of salt; this is kept in stock solution. When required one pint of boiling water is added; this gives the correct strength and approximately the correct temperature (about 100°F.). In practice the proprietary Soloids of salt may be used. The abdomen is examined and the following facts are found: (1) that the uterus is soft and painless; (2) that the presenting part is high and unfixed, and gives the definite impression that it is sitting on something; (3) a uterine souffle is heard in the region of the hypogastrium. Some authorities have suggested that the diagnosis is now made: painless bleeding, prematurity, soft painless uterus, high presenting part, uterine souffle, clotted blood. We do not subscribe to this dictum. These cardinal facts suggest the abnormality; they do not make the diagnosis definite. We hold that the only way to make a definite diagnosis is to examine the patient by the vagina. Before making this examination the doctor should have decided on his next step, for he can at any rate have made a provisional diagnosis; the vaginal examination may cause hæmorrhage, and it may be necessary to treat the case immediately the vaginal examination is concluded. In placenta prævia, more than in any other condition, must a vaginal examination be made under extreme aseptic precautions. Sepsis is more than possible, but the danger of missing the diagnosis without vaginal examination is greater than the danger of sepsis. If the cervix is closed, the low implantation may be suspected by a boggingness in one or all of the fornices. If the os is open, the placenta itself is felt. It is indeed simple to diagnose the placenta; we advise our students to familiarize

themselves with the touch of a normal placenta, when the diagnosis of a prævia is simple.

An examination of the urine should be made in all instances; it will probably be found to be normal. Toxæmia is seldom an accompaniment of placenta prævia, although as an exceptional circumstance it may be so. This exception must be specially stressed; when present, it is most common in the primigravida, and the case will be a typical placenta prævia with toxæmic symptoms.

#### Differential Diagnosis.

There are many differential points in diagnosis when a woman bleeds in the last three months of pregnancy:—

1. Accidental hæmorrhage.
2. Excessive show.
3. Varicose veins in some part of the tract—for example, vulva, vagina, cervix.
4. Hæmorrhoids.
5. Carcinoma of the cervix.
6. Polypus.
7. Erosion of the cervix.

In addition it may be necessary, on examining the abdomen and finding the "high head," to diagnose from: disproportion; and, on vaginal examination, from hydrocephalus, anencephalus, vasa prævia, and cervical varix.

Most of these are soon cleared up. An excessive show may always be confused with any variety of ante-partum hæmorrhage; its diagnosis is made by the speedy cessation of the hæmorrhage, accompanied by the absence of physical signs of placenta prævia. Varicose veins of the vulva or vagina will readily be seen; the same applies to the bleeding from hæmorrhoids. Occasionally an erosion of the cervix or a polypus may bring about symptoms suggestive of placenta prævia, but the erosion and polypus are visible through a speculum. Carcinoma of the cervix will be accompanied by history and physical signs. Occasionally one meets in a primigravida a condition of "high head" which is suggestive of disproportion. The commencement of the cardinal symptoms of placenta prævia suggests this abnormality, but a careful examination must be made to confirm the diagnosis. We have had a case lately at the Rotunda where the placenta acted as a mechanical cause of delay in labour, and this was perfectly evident at the Cæsarean section operation which was indicated later. It is only necessary to draw attention to this differential point in diagnosis, and to remember that occasionally the two may occur together.

Hydrocephalus must be mentioned, for the enormously separated fontanelles may give the impression of a cervix with placenta protruding through. In addition the height of the head when felt by the abdomen may give a wrong impression. Anencephalus may simulate anything. Vasa prævia may suggest placenta prævia, but it is unimportant.

The condition which is most frequently mistaken for placenta prævia is accidental hæmorrhage, and since the treatment for each of these conditions is very different, and as the treatment for the one is entirely unsuitable for the other, the importance of making a correct diagnosis is obvious. It is well at this stage to consider the various factors in making a diagnosis between the two.

(a) *Parity*.—Placenta prævia is more common in the multipara than in the primigravida, but it is found in the primigravida. Accidental hæmorrhage is always found in the multiparous patient.

(b) *Toxæmic symptoms* are nearly always present in accidental hæmorrhage, and they are usually absent in placenta prævia. In spite of this assertion it is necessary to give a warning: accidental hæmorrhage may occur without toxæmia, and severe toxæmia accompanied by placenta prævia may arise. During the past year a patient who was being carefully observed during her pregnancy developed albuminuria near the end. She was admitted to hospital, and efforts were made to overcome the toxæmia. The albuminuria never disappeared, and a week before term all symptoms of placenta prævia were present. We were dealing with a hugely fat primiparous patient with albuminuria, a one-finger cervix, and central placenta prævia. For this rare combination of circumstances there was only one treatment—Cæsarean section.

In this exceptional case the diagnosis was difficult. It was made without vaginal examination, and confirmed by a vaginal examination immediately before operation.

(c) *Period of pregnancy*.—Accidental hæmorrhage varies. Placenta prævia more commonly occurs as a premature birth.

(d) *Pains* are a usual accompaniment of accidental hæmorrhage; they are always absent in placenta prævia.

(e) The *abdomen* is tense, and the presenting part is fixed in accidental hæmorrhage; while in placenta prævia there is a flaccid abdomen with malpresentation or non-fixation of the presenting part.

(f) The *fœtus* is dead in the majority of cases of accidental hæmorrhage; it is alive at the commencement of labour in placenta prævia.

(g) The *hæmorrhage* which occurs in accidental hæmorrhage is continuous and is blood-stained serum; it has been squeezed out of the uterus like the juice from an orange. The hæmorrhage in placenta prævia is fresh clotted blood, which may come in gushes and varies in amount.

Finally, in discussing differential diagnosis we must refer to a type of case occasionally encountered and already mentioned. A woman who is eight months pregnant suddenly pours blood, becomes collapsed, with imperceptible pulse and other accompanying symptoms. Does one waste time in diagnosis? No, for it is nearly certain. She is immediately given treatment for collapse, while pledgets of cotton-wool are boiled in a saucepan; these are used to stop the hæmorrhage, and the absolute diagnosis is made later when the collapse symptoms have disappeared, and therefore when the patient is ready for active treatment.

#### PROGNOSIS AND DANGERS.

The prognosis where a case has been correctly diagnosed and treated is excellent; in fact, we feel we may borrow an apt aphorism on another subject, and say "our patient should not die from placenta prævia."

There are dangers, both immediate and remote. Death from collapse following hæmorrhage is possible. Death from sepsis from manipulations, low implantation, and diminished vitality must be feared. Anæmia may last for some time, and the patient should be allowed to recover thoroughly from a placenta prævia confinement before embarking on another pregnancy. Contrary to the experience of others, neither adherent placenta nor post-partum hæmorrhage has been found common with our patients.

To our mind, the prognosis depends on diagnostic ability with choice and technique of treatment. Treatment does not come within the scope of this communication.

#### SUMMARY.

1. It is difficult to separate diagnosis from treatment.
2. Nomenclature, both with regard to period of pregnancy and situation of placenta, is considered.
3. Rigby of Notts should be given priority in making a diagnosis between placenta prævia and accidental hæmorrhage.
4. A pathological condition of the endometrium is a fruitful cause of placenta prævia. Curettage should be done before the next pregnancy.
5. The incidence of placenta prævia in 69,000 deliveries was 1 in 183, while the mortality was 1 in 17. There has been no mortality at the Rotunda Hospital in the last 55 cases.
6. Although there are others, accidental hæmorrhage is the important condition to diagnose from placenta prævia. The methods of doing so are given.
7. Prophylactic submammary saline is an essential part of treatment during the diagnosis.
8. Toxæmia is not a usual accompaniment of placenta prævia; an exceptional case where it occurred is mentioned.

We shall conclude by saying that the whole paper might have been summed up in a few words as follows: That the symptoms and diagnosis of placenta prævia might be written down—an absolutely painless clotted hæmorrhage, insidious in nature, some time in the last



three months of pregnancy. It seemed necessary, however, to refer to some salient points in order to remind ourselves and the world that women may be saved by a careful and exhaustive diagnosis which leads to correct treatment and a satisfactory result.

### Observations on Diagnostic and Other Errors in Questions of Venereal Disease.

By L. W. HARRISON, D.S.O., M.B., CH.B., F.R.C.P. (Ed.).  
(*The Brit. Med. Journ.*, September 14th, 1929, p. 483.)

THE subject of this paper was suggested to me by a run of such cases as the following:—

A man of good position asked me to examine him for gonorrhœa. He said that a year previously he had contracted gonorrhœa, which had cleared up completely without any complication. About three months before I saw him he had married, after passing careful tests by a conscientious specialist. A month after marriage his wife developed a Bartholinian abscess, and on the strength of this the husband was told that he had infected his wife with gonorrhœa. You can imagine his distress. I examined him three times and failed to find any evidence of disease in his urethra or adnexa. A complement fixation test for a gonococcal infection carried out by Dr. Osmond gave a completely negative reaction, and I had no hesitation in saying that he was not suffering from gonorrhœa. On my advice, his wife was seen by Dr. Margaret Rorke, who reported that she could find absolutely no sign of gonorrhœa, and that the bacteriological tests strongly suggested a *B. coli* infection as the cause of the Bartholinian abscess.

You will realize that there were the makings of a marriage wreck in this history, and all from the assumption that a Bartholinian abscess spells gonorrhœa, from failure to make bacteriological tests of the abscess pus, or to examine other parts of the genito-urinary passages for confirmation of the suspicion.

In the course of a few years a specialist in venereal diseases meets a respectable number of cases in which mistakes in diagnosis have been made through failure to take even a little trouble over examination of the patient, and the consequences are often so distressing to the patient, so full of possibilities for wreckage of domestic happiness, that I thought it would not be a bad thing to make some of them the subject of a contribution to the proceedings of this Section. Fearing lest I should omit mention of some important errors, I asked my colleagues in the St. Thomas's Hospital Venereal Diseases Department to give me the benefit of their experiences in this matter, and I am indebted to them for some which I should probably have overlooked.

In questions of gonorrhœa it may sound surprising, but ordinary balanitis is sometimes diagnosed as gonorrhœa. I remember a case in which the mother of a boy at a public school was requested to remove him because the school doctor said he had gonorrhœa. He had simple balanitis. Dislike of examining the penis at close quarters must account for numbers of cases commonly seen in which a syphilitic chancre at the meatus or within the fossa navicularis has been diagnosed as gonorrhœa. It is quite a common thing to see cases of tertiary syphilis in which the patient denies any history of a sore, but admits gonorrhœa. I cannot help thinking that in a number of these, in which the patient says that the discharge was only slight and rather watery, the trouble was due to an intra-urethral chancre. The omission of a microscopical examination leads to many cases of urethritis which are due to chemical causes, to constitutional disturbance, or to infection with diphtheroids, staphylococci, *B. coli*, or organisms other than gonococci, being treated as gonorrhœa with potassium permanganate irrigations or with one of the fifty-odd preparations of silver which have been put on the market for this complaint. Sometimes a microscopical examination has been made, but only a simple stain has been employed, and a few streptococci inside pus cells have been diagnosed as gonococci. Sometimes a so-called Gram's stain has been used, but the violet has been dissolved out of

Gram-positive cocci by prolonged application of methylated spirit, and the process of conversion of Gram-positive cocci into seemingly Gram-negative ones has been completed by a prolonged application of such a stain as carbol-fuchsin.

On the female side vaginal discharges due to a multitude of causes other than gonococcal are commonly diagnosed as gonorrhœa. On the other hand, I have known scores of cases in which a woman who has clearly infected a patient has gone to a practitioner and been passed as free from gonorrhœa on the strength of one naked-eye examination, or at most a single microscopical test. It has forgotten that a cervical canal may be swarming with gonococci without a pus cell being present, or that gonococci may only intermittently come to the surface of the cervical canal, and that not one but many examinations are necessary to exclude gonorrhœa in a woman.

I have seen a number of cases in which the sudden appearance of a urethral discharge, due to the breaking open of a prostatic abscess which has formed quietly, has been diagnosed as gonorrhœa solely on the appearance of the discharge, or on badly stained microscopical specimens. Most of the cases have been in married men who, for one reason or another, had for some time suspended sexual intercourse. I imagine that their prostates had for years been secreting pus, but sexual intercourse had kept the foci draining. The micro-organisms have been in different cases staphylococci, *B. coli*, *B. lactis aerogenes*, *B. pyocyaneus*, *B. proteus*, and others, but not gonococci. One would think that in such a case common sense would dictate a microscopical examination of the pus; and, if the patient is married, as he often is, one might think it not a bad idea to make an inquiry as to the wife's condition before thrusting the patient into hell with a diagnosis of gonorrhœa. It may be worth mention here that a non-gonococcal prostatitis can cause symptoms which simulate typhoid, and I have known of some cases being treated for this disease even after the abscess has burst.

Epididymitis, especially if accompanied by a urethral discharge, seems often to write the word gonorrhœa in the practitioner's mind to the exclusion of every other possible diagnosis—for example, an infection with *B. coli*, or even *B. tuberculosis*. Yet only a few more minutes spent over the examination would serve to avoid the error if the case is not gonococcal. I have known some cases of right-sided gonococcal epididymitis diagnosed as appendicitis. The patient suddenly had an acute pain in his right iliac fossa, his temperature went up to 103° or 104° F., and perhaps he vomited. But his right rectus was not rigid, he did not look like an appendix case, and pressure on his cord as it crossed the ischio-pubic ramus caused very severe pain. By these signs, when I was in charge of a very large number of in-patients suffering from gonorrhœa, I saved quite a number of innocent appendices from removal and had none of general peritonitis.

In cases of arthritis, iritis, and similar troubles often classed as gonorrhœal, microscopical and cultural tests often fail to discover the gonococcus, and the complement fixation test with a gonococcal antigen is negative. On the other hand, my colleagues and I have seen a fair number of cases of gonococcal arthritis soaked with salicylates, or with potassium iodide, gonorrhœa not having been thought of, or having been excluded on the score of naked-eye examinations.

I owe much to the help of the microscope, to the culture tube containing a properly made medium, and to the complement fixation test. Properly used they save one from many pitfalls. They do not dispense with ordinary clinical tests, but to deny oneself their help is to walk blindfolded.

Turning now to cases of chronic gonorrhœa, I think the number of innocent prostates and seminal vesicles which have been massaged for trouble which a careful examination would have localized in the anterior urethra must be many thousands. Sometimes it is because in the textbook it says that prostatic massage will often clear up a chronic case of gonorrhœa, and so, without further

examination, the prostate is massaged. Sometimes a specimen of prostatic secretion is examined, but it has flowed along a urethra cleansed only partially with a stream of urine, not previously washed down by irrigation as it should be, and so the prostatic secretion contaminated with pus picked up in the urethra has been found to be pathological.

Omission of a urethroscopical examination leads often enough to months of treatment which a touch with a cautery point on one discharging follicle would clear up in a few days. Sometimes I have destroyed a small para-urethral canal and so ended a chronic urethritis which has kept a patient miserable for years.

Chronic urethritis is notoriously difficult to clear up, but I am certain that, if more pains were taken to examine and no method of examination omitted—microscopically, cultural, complement fixation, naked-eye inspection both outside and inside, as well as palpation with fingers and through the medium of instruments—much unhappiness of patients would be avoided. And a patient with a chronic urethritis is generally an unhappy man, far more so than one with a chronic catarrh of the nose or bronchi, and it is important to cure his urethritis, even though it may not be physically of any moment.

In questions of syphilitic infection, I would mention first the pernicious practice of commencing the treatment of early cases on mere suspicion—to give the patient the benefit of the doubt as is often said. Those who commence treatment on such principles without having verified the diagnosis by bacteriological methods cannot have much imagination of the effect of a diagnosis of syphilis on the patient's mind. Every syphilologist must have seen numbers of cases in which the patient gave a history of a genital sore which was not examined microscopically, and on the strength perhaps of what was called a weakly positive reaction, or even without any blood test at all, treatment was commenced. The history has left one with a very considerable doubt as to the correctness of the diagnosis, but in most cases one has not dared now to suspend the treatment because the negative reactions might be due to the treatment already given, even though this has been trivial. In some cases, however, I have been so convinced that the original diagnosis was wrong that I have suspended treatment. The reactions have remained negative, but the patient has not been freed of anxiety about his future; he has continued to be tested regularly, and when he has married, if one of his babies has snuffled a little, had a rash of any description, or any ailment whatever, he has worried over the possibility that I was wrong and that he had after all transmitted the disease to his offspring. The pitiable condition of his mind is due to the fault of the original man who commenced treatment to give him the benefit of the doubt. There need be no doubt. With bacteriological aids properly employed the diagnosis of an early case can be made with certainty, and, as a rule, rapidly. Promptitude in commencing the treatment of an early case is certainly important, but I am sure that it is not so important as certainty of diagnosis.

I have mentioned diagnosis on the strength of a serum reaction which is called "weakly positive." In the *Journal of the American Medical Association*, 1926 (Vol. 87, p. 1351), there appeared an article by J. H. Mitchell entitled "Menace of the slightly positive Wassermann reaction," with which I am entirely in sympathy. The author related cases in which a false diagnosis of syphilis had been made on the flimsy evidence of a weakly positive Wassermann reaction alone, or in conjunction with some non-specific dermatosis having a superficial resemblance to syphilis, such as pityriasis rosea or lichen ruber planus. The result had been the firm establishment of that intractable disease syphilophobia. Sometimes marriage engagements had been broken, and at others divorce proceedings been instituted, in consequence of a dishonest or an ill-trained practitioner founding a diagnosis of syphilis on such a reaction. I am sure that every syphilologist of standing could relate similar cases, and I am convinced that the term "weakly positive" should never be applied to any reaction which is weaker than the pathologist's standard for a diagnosis

of syphilis. I have always maintained that, for reactions which the pathologist considers insufficiently strong for a diagnosis of syphilis, the term "doubtful" should be employed, and if I got a report that a specimen gave a "weakly positive reaction," I should ask the pathologist if he meant by it such a reaction as is given only by syphilitic serums or one given sometimes by non-syphilitic.

A false diagnosis of syphilis is sometimes based on a single positive reaction with clinical signs which are only faintly suspicious. As an example I have in mind a patient I once saw who had been diagnosed as syphilitic on the strength of an ulcer on the lip and a single positive reaction. No *Sp. pallida* had been found in the secretion from the ulcer, there was no adenitis, and the whole history made a diagnosis of syphilis only the faintest possibility. The patient had attempted suicide after being told he was suffering from syphilis. Another specimen of serum was sent to be tested in the same laboratory and this time was reported as negative. I have always taught that, if a report that a serum reaction is positive is not supported by the clinical data, another specimen of blood should be sent. It is no disparagement of the care taken in laboratories to prevent errors to say that every now and again one will occur; specimens may be confused, a dose of complement may be omitted from a standard tube, a piece of cigarette ash may fall into a standard tube, or a number of other little things may happen which result in a normal serum being reported as positive. Such accidents do not happen once in a thousand tests, but, when they do happen, be sure it will be the specimen in which it is most important that no mistake should be made. If I have the least doubt of a result, I have another specimen tested.

As a good example of a mistake which can happen from jumping to conclusions from a naked-eye examination the following was related to me by my colleague Dr. Anwyl Davies. A person was sent to him with a diagnosis of primary sore on the penis and a secondary rash on the abdomen. Examination showed an oval ulcer on the glans penis with a tender inguinal gland. There was an erythematous rash on the abdomen below the umbilicus, and the combination might easily have been mistaken for syphilis. A prolonged search failed to discover *Sp. pallida* in the secretions, and close questioning revealed that in treating honeycombs with a chemical called "beemol," used to prevent Isle of Wight disease, some had dripped on to his waistcoat and passed through this to his skin. The subsequent history proved this to be the correct explanation of the lesions.

The mention of chemicals reminds one that a very fair imitation of a primary sore can be produced by self-applied caustic stick, and a burn of a lip by a cigarette has been diagnosed as a mucous patch. I once spent an afternoon on a medical board cleansing the record of an officer who had been diagnosed as syphilitic and had protested. The diagnosis had rested on what was said to be a mucous patch on the posterior pharyngeal wall. There was absolutely no evidence of syphilis, but there was a narrow stream of mucus stealing down the middle of the posterior pharyngeal wall, and with only a little book-learning for guidance one might have said it was a snail-track ulcer. Of other conditions in the throat Vincent's angina and diphtheria are, of course, common sources of error.

Scabietic runs on the glans penis are quite commonly diagnosed as primary chancres, especially if they have become a little crusted, and, on the other hand, a cervical chancre on the cervix is sometimes diagnosed as a gonorrhoeal erosion.

Warty conditions about the genitals are a great source of error. Numbers of cases of syphilitic condyloma have been treated for weeks with an ointment suitable for hæmorrhoids. Sometimes the patient has not even been examined, and the ointment has been prescribed on the patient's request for "something for piles." On the other hand, many warty conditions have been diagnosed as syphilitic because presumably they were warts, and syphilitic condylomata are warts. In most of these cases, apart from the fact that a careful examination is usually

sufficient to distinguish a syphilitic condition from a non-syphilitic, a microscopical examination of the serum from any early syphilitic lesion will usually settle the matter.

Perhaps a less serious error is to diagnose every syphilitic lesion on the genitals as a primary ulcer. It may be awkward then if the patient relates a history of syphilis a few years old and, the lesion being really a gumma, the serum reactions stubbornly remain positive.

Extragenital chancres are commonly overlooked. I have known of a tonsil which was the seat of a chancre being enucleated and the same patient being sent later to a fever hospital for German measles, the true diagnosis being reached only when the eruption did not clear up in the time usual for measles. Chancres of a terminal phalanx are usually diagnosed as whitlow until a rash appears. The worst error of this kind I ever saw was in a medical officer who was looking after syphilis cases during the war. He allowed his finger to be treated for whitlow, and his tonsils to be cauterized for ulcers, and then went peacefully to hospital for measles. It dawned on him that he had accidentally contracted syphilis, when the measles rash was succeeded by a profuse papular syphilide.

A common mistake is to assume that in a patient with positive serum reactions all abnormalities are themselves syphilitic.

Tertiary syphilis of the tongue has led to many epitheliomata there being overlooked, and I would caution against being misled by a temporary improvement following administration of arsenobenzene preparations in these cases. The tendency to regard all lesions on the genitals as venereal in origin sometimes leads to an epithelioma of the penis being diagnosed as gumma.

Gummata of the testicle have fairly often been removed under a diagnosis of new growth. In one case which I remember I feel sure that the practitioner and also the pathologist were misled by the blameless life of the patient, and it was not until many months later, when an undoubted gumma occurred elsewhere, that the blood was tested.

I think the tendency in nervous diseases is to think of syphilis and in cardio-vascular disease to forget it. At least quite a number of cases of nervous disease due to causes other than syphilis have been sent to me for treatment, and I have seen a fair number of cases of syphilitic myocarditis in which I wished my predecessors had thought of syphilis earlier and left me with less of a wreck to treat.

In questions of treatment it is always a source of wonder to me that there are so many people who give only partial treatment if there has been a doubt about the diagnosis. They would probably agree at once that a thing cannot both be and not be, but yet they act as if it could.

In patients under antisiphilitic treatment failure to diagnose certain skin rashes as due to arsenic and continuance of the treatment has led to most tragic results; so much so that one would emphasize with all one's strength the advice to take serious notice of any dermatosis in a patient undergoing arsenobenzene treatment, however trivial the skin affection may seem. One should consider most seriously whether or not this is arsenical, and decide on continuance of this form of treatment only on firm conviction that it is not. Otherwise the result may be a dermatitis from which the patient may die, or recover only after a long and trying illness. I ought to mention here that bismuth sometimes causes a troublesome dermatitis, though it is very uncommonly so acute as can be one due to arsenobenzene.

I have thus attempted to set out some of the commoner errors in diagnosis in questions of venereal disease. The subject could be expanded to far greater length, but even if space would permit of this the result would only emphasize still more the principle, that, in venereal diseases as in others, one must look for and gather all the evidence which will bear on the diagnosis. And, having gathered the evidence, one must sift it with judgment and common sense. If this discussion leads to some reduction in the wretched victims of wrong diagnoses—the poor devils who go through life under the

shadow of an anxiety for which there is no real reason—it will have done some good.

## Observations of the Cause and Prevention of Influenza and Influenzal Pneumonia.

By E. C. ROSENOW.

(Abstracted from *International Medical Digest*, Vol. XV, July, 1929, No. 1, p. 15.)

THE author suggests the following hypotheses regarding the *Bacillus influenzae*:—

Peculiar strains of these organisms occurring individually or symbiotically should be considered the cause of the varied manifestations of influenza. Mutation or "dissociation" in the pneumococcus-streptococcus group normally present in the upper respiratory tract in human beings, sudden acquirement of exalted and peculiar virulence, especially of the streptococcus group, and hypersensitiveness or allergy to the bacterial proteins, should be considered as important factors in the production of the peculiar manifestations of this disease.

He had previously stated that:

"The freshly isolated strains from influenza and its accompanying lesions have been found to produce relatively large amounts of 'anaphylatoxin' both *in vitro* and *in vivo*. The idea that the virulence of these bacteria may depend in part on their ability to produce 'anaphylatoxin' is in accord with my previous finding that virulent pneumococci and their filtrates produce a larger amount of this toxic substance than virulent pneumococci. The picture in animals is clearly that of an anaphylactic intoxication, and suggests that the symptoms and lesions in man as recorded by numerous observers may likewise be due to this cause in which sensitization of the host to the bacterial proteins may or may not play a part. Findings as follows indicate this mechanism:

1. The delay in the coagulation time of the blood, leucopenia and cyanosis.
2. The marked tendency to develop acute pulmonary oedema with a distended lung and relatively immobile expanded chest and extreme respiratory effort.
3. The voluminous lung as found at necropsy.
4. The occurrence of the rupture of alveoli and consequent subcutaneous emphysema (bronchial spasm).
5. The frequency of abortion (contraction of unstriated muscle) and other uterine disturbances.

"The small anaerobic organism isolated from filtrates by Olitsky and Gates in the early stages of influenza should be regarded as being related to the streptococcus-pneumococcus group. They have shown that after long cultivation the organism becomes less anaerobic, of larger size, and of fairly typical streptococcal morphology."

While common-sense measures of quarantine are indicated in epidemics, the disease cannot adequately be controlled in this way. The author recommends that a concerted effort on a large scale be made against this disease by means of vaccines prepared from freshly isolated strains in proportions approximating the bacterial flora in different localities.

The method of preparation is as follows:

The bacteria are grown in gallon bottles of broth; this is clarified and the bacteria then are stored in dense suspension in glycerin and sodium chloride solution. The vaccine is made by diluting these dense suspensions with sufficient sterile sodium chloride solution. These dilutions are heated at 70°C. for one hour and 0.3 per cent. phenol is added as a preservative. One cubic centimetre is made to contain 5,000,000,000 killed bacteria. Three subcutaneous injections of 0.3, 0.5 and 1 c.c., respectively, are given at weekly intervals, and then a monthly injection of 1 c.c. for as long a time as needed. The dosage for children should be about half, and for infants about a fourth that for adults.

### Stammering in Women.

(Abstracted from *The Medical Press*, September 25th, 1929, p. 247.)

SEVERAL writers to *The Times* have remarked upon the preponderating number of stammerers in the male sex, the proportion of male to female stammerers being about five to one.

Be the explanation what it may, girls and women are much more glib of tongue than boys and men. One notices this difference especially in comparing the speech of little girls and boys. Little girls overcome the difficulties of enunciating consonants more readily than boys—and stammering pertains, of course, to the consonants. We are apt to lose sight of the complexity and delicacy of muscular co-ordination needful for the enunciation of the consonants. One of the most difficult is the *th*. The *h* of the *th*, not being pronounced in the German language, has of recent years been (wisely, I suppose) omitted, so that *That* is now written *Tat*, and *Their*, *Tier* (which, etymologically speaking, is to be regretted).

It is remarkable that, unless a foreign language is taught before adolescence is completed, the student rarely learns to pronounce it correctly: the nerve centres engaged in articulation tend to lose their plasticity after adolescence.

### Spectacles and their Origin.

(Abstracted from *The Medical Press*, September 18th, 1929, p. 229.)

THE 300th anniversary of the grant of a charter to the Company of Spectacle-makers has been the occasion of a congress and exhibition in London. The identity of the actual inventor of spectacles is uncertain, but there are grounds for attributing priority to Salvina d'Armato, the inscription on whose tomb at Florence, which is dated 1317, describes him as the inventor. Roger Bacon and others are similarly credited with the honour, and there is doubt whether spectacles were not known to the ancient civilizations of the East. The use of lenses for reading and other purposes was doubtless employed by the monks in mediæval times, and there is a fresco at Treviso which was painted in 1352, in which eye-glasses are depicted. From one single lens there evolved in time the pair of spectacles with side-pieces to keep them in position, and the curved bridge to support them on the nose, the mounts varying from leather to metal strips which passed round or over the top of the head. The Chinese used cords fixed to the glasses and carried over the ears, to be held in position by weights at the ends. Not until the eighteenth century do hinged side-pieces appear. The development and use of spectacles were forwarded by the invention of printing and the revival of learning in the fifteenth century, following which guilds of spectacle makers arose in Italy, Germany, France, and probably England, though the account of any such guild before its incorporation disappeared in the Great Fire. In earlier times spectacles were peddled by vagrant craftsmen such as is depicted in Ostade's picture of "The Spectacle Maker," who appears with his basket offering to the purchaser a pair which "suited" the vision of his customer. In 1804, a pair of spectacles could be obtained for three shillings and sixpence; in 1846, pince-nez came into fashion as a refinement of their predecessors, the lorgnettes. Examples of lenses of quartz or pebbles, of coloured glasses used for protection from glare, of Helmholtz's ophthalmoscope, and of Marshall's lenses are exhibited in the museum of the British Optical Association and Science Museum. There also may be seen Divini's compound microscope, Hooke's microscope of 1665, and Marshall's compound microscope of 1693, which was described a few years later as having been invented for "viewing the circulation of the blood." The invention of the microscope is generally credited to Jansen, in the sixteenth century, and that of the telescope to Gianbattista della Porta. Newton was the first to use a reflecting

telescope, and a terrestrial telescope made by Christopher Cook in 1673 is still preserved.

## Essay Review.

### REPORT OF THE BENGAL FIELD MALARIA RESEARCH LABORATORY AT KRISHNAGAR FOR THE YEARS 1926 TO 1928. BY S. N. SUR AND P. SUR, CALCUTTA, BENGAL GOVERNMENT PRESS, 1929.

IN a review of the work of the Sonarpur Malaria Observatory in this journal (Vol. LXIII (6), 1928) the writer expressed regret that this station had been practically closed down for the last three years, but the present report shows that it was only closed down to be immediately reopened elsewhere in the Province. As with the earlier report, the present one is simply packed with invaluable information, and it is much to be regretted that in spite of the recent editorial in this journal about the occlusion of work of this nature in Local Government papers, the present report is again marked "for official use only."

The chief problem studied was the species of *Anopheles* causative of malaria in the Central Bengal district in which the new laboratory was located. As the sketch map shows, the area chosen was admirable, for a short journey enabled villages with 100 per cent. and 9 per cent. spleen rates to be compared in regard to their anopheline population.

The anophelines incriminated are the three species of the *fuliginosus* group, which Dr. Strickland and the writer have both been able to neglect in other parts of India. With proper scientific caution the authors of the report close with the following:—"We must not conclude that the observations we have made in Krishnagar. . . . will be true for other districts. . . . Every district may have got its own fauna of mosquitoes and their special peculiarity of prevalence and habits." Strickland's working hypothesis of "once a carrier, always a carrier," is *vis-à-vis* the results of the Drs. Sur and his and my own, shown to be very dangerous, and those of us who have to found controls on brief surveys may well envy the opportunities which the Drs. Sur have so well made use of, to remain in one spot studying one problem for 2½ years.

Chart 3 of the report shows that humidity and temperature (if Jancsó's work be directly applicable to India) are favourable to transmission throughout the year. There is a sharp drop in temperature from October to March, with a minimum in January, and a sharp drop in relative humidity from January to April, with a minimum in March, but Table I, dealing with the sporozoite rate of the *fuliginosus* group, shows that not only are sporozoites found from August to December, as one would expect, but, in both winter seasons in which work was in progress,

after a negative January, there was a positive February rate higher than any monthly rate in the malaria season. From Table III, where the three species of this group are listed separately for sporozoite rate, we see that the infections at this season are all in true *fuliginosus*, but apparently the other two species are very rare at this time of year. This Table III shows that in the malaria season, the last third of the year, it is *philippinensis* that is the carrier. Only once, in 15 months' dissections, was *A. pallidus* found infected, three specimens in October 1927, thus confirming the general acceptance of this species as of no practical importance.

When, however (Table IV), we come to artificial infections, we find *pallidus* to have a higher rate than *fuliginosus*, whilst *philippinensis* were all negative, but this last, we think, can be attributed solely to the small number available for experiment, nothing less than a 14 per cent. rate (higher than either of the others) could have been expected to yield a positive finding.

We have then to study the positive February findings in *fuliginosus*. Such should show themselves by an increased incidence of new cases of malaria in March (Table II), but this is not seen to occur. As sporozoites cannot be specifically differentiated, can it be that in winter *fuliginosus* is showing the result of the operation of "Jansco values" for some (?) bird *Plasmodium*, and that the infections found are not with any of the human species? For (Chart I), though in both years the number of breeding places is approaching its minimum in February, yet (Table Va), it is at its percentage maximum in human dwelling houses in this month, and (Table Vb), at its percentage maximum, or near it, in cattle sheds. Neither are the actual numbers in both houses and cattle sheds in the month insignificant, for, by calculation from these tables, we find the following comparisons:—

	February.		November.*	
	Houses,	Cattle sheds.	Houses.	Cattle sheds.
1927	.. 224	716	341	263
1928	.. 282	80	740	325

There is therefore no apparent reason why in February there should not be a malaria incidence almost equal to that of the earlier months of winter, the more so as it has already been shown that the percentage infected is higher in February than in any other month. If these sporozoites are of human species, then some completely unenvisioned factor precludes them from causing infection.

With all due deference to the conclusions of the authors that the carriers of the Nadia District are the anophelines of this group, may we direct their attention to the following table, made up

from their Tables Va and XI, in connection with *A. minimus*?

1927.	Caught in houses (actuals).	Percentage of new cases malaria.
January	.. 0	3.6
February	.. 0	2.6
March	.. 2	2.5
April	.. 2	1.7
May	.. 1	2.0
June	.. 0	2.0
July	.. 2	2.8
August	.. 6	4.0
September	.. 11	4.7
October	.. 27	13.3
November	.. 11	31.0
December	.. 11	29.5

May not the sharp rise in *minimus*, not a species which remains in houses after biting, according to Carter and Jacocks, in September, start the annual epidemic, which is then kept up by the enormous numbers of the much less susceptible *fuliginosus* group thereafter? But Chart 6 shows how closely *fuliginosus* is correlated with fever. The incidence of *culicifacies* in houses, save in the first three months of 1927, over the whole of the rest of the two years, is so insignificant that this species can have nothing whatever to do with malaria at Krishnagar.

Table Vc gives interesting comparisons between the preference for human and bovine blood in the different species. From this we see that thrice as many *rossi-vagus* are found in houses as in cattle sheds, whilst the *fuliginosus* group has an over 50 per cent., *A. pseudojamesi* thrice, and *A. sinensis* 250 per cent. preference for cattle over men.

Tables VIII and IX give interesting details of breeding prevalence by larval catches by species in each month, from which we see *rossi-vagus* with a May to July maximum, the *fuliginosus* group in September, *minimus* in November, *culicifacies* in April, *sinensis* about December, whilst *barbirostris* varies from October to January. In Table IXa we get two villages with low spleen rates compared with one with an 80 per cent. rate. The overwhelming prevalence of the *rossi* group in the two former is well brought out.

Table X gives some details of survival rates, species by species and month by month. This is of extreme importance. Survival over 11 days, even in the most favourable period for transmission, is probably essential for infectivity to develop. But the table would have been infinitely more valuable if the monthly percentage by species had been worked out, instead of all species by the month. The general rate for *fuliginosus*, *sinensis* and *rossi* is shown to be 67, 51 and 23 respectively, but owing to differing number of different species having been experimented with, the table as it stands is not of as much value as it might be, and we have recast it as follows:—

\* Month preceding maximum new case incidence of year.



Percentage surviving 11 days and over.

	<i>fuliginosus.</i>	<i>sincensis.</i>	<i>rossi.</i>
January ..	97	60	39
February ..	76	67	33
March ..	67	20	14
April ..	50	..	12
May ..	67	..	22
June ..	80	..	44
July ..	60	..	0
August ..	28	0	10
September ..	66	17	17
October ..	67	40	38
November ..	63	70	28
December ..	69	71	25
AVERAGE ..	67	51	23

Anyone interested, from this table with Table Va can work out the number of specimens of these three species at least that were alive in the house catches each month with a greater age than 11 days, and then proceed to correlate with new infections, from Table XI, so far as mosquitoes protected can be compared with mosquitoes free. But in the rains free mosquitoes are at risk from wind and rain in their ovipositing journeys, whilst nothing is known of the seasonal activities or prevalence of hunting spiders, geckos, etc., but the work here recorded suggests lines of research which are completely untouched.

After 18 pages devoted to the above details, the parasite incidence is next recorded: 1,055 positive slides over two years (55 per cent. + ve) give total species distributions of *P. vivax* 24.6 per cent.; *P. malariae*, 14.3 per cent.; *P. falciparum* 41.2 per cent.; mixed 19.8 per cent. Most unfortunately no details of the mixed infections are given. By months we see *vivax* maxima in April to May and August to September, *malariae* maxima in March and May (not in winter), and *falciparum* maxima at the end of the year and into January. The mixed infections are very high in winter, but much of the value of this work is lost by the non-recording of details of the mixed infections. Similarly the gametocyte figures, which would have been absolutely invaluable, are spoiled by similar lack of recording. We would urge the authors to republish Tables XII, XIIa, and XIII with details of mixed infections.

Seasonal variations in the spleen index are next discussed. Two villages showed big fluctuations in the crude rate, but the 100 per cent. village Jatrapur remained at this figure throughout. The fluctuations were seasonal. One-finger spleens disappear in the epidemic and post-epidemic seasons, whilst the "beyond umbilicus" group varies inversely with them.

We would again most heartily congratulate Drs. S. N. and P. Sur, and their Chief, Dr. Bentley, on the work that has been carried out. We have heard a cry about the indifference of Government to the decimation of Bengal by malaria. The years of work at Sonarpur and

Krishnagar, all, be it noted, carried out by Indians, effectively give the lie to these political cries. When, in a sober moment, Bengal takes stock of its public benefactors, S. N. Sur, P. Sur and M. O. T. Iyengar will be remembered long after C. R. Das, Subas Bose, and other political agitators have sunk with Perkin Warbeck into the limbo of historical curiosities.

R. SENIOR-WHITE.

## Reviews.

**A DICTIONARY OF SCIENTIFIC TERMS.**—By I. F. Henderson, M.A. and W. D. Henderson, M.A., B.Sc., Ph.D., F.R.S.E. Second edition. Edinburgh: Oliver & Boyd. Pp. 352. Price, 16s.

THIS is an excellent and much needed book, and a copy of it should be in every scientific library in India. It includes in all some 10,000 terms used in biology, anatomy, botany, zoology, embryology, cytology, physiology, bacteriology, and palæontology. For each word the derivation is given, in most cases of course from either Greek or Latin, and for the sake of simplicity the Greek words are transliterated into the Roman alphabet.

In the second edition some 1,500 new terms have been included and the whole re-set. Both the authors and the publishers have done their work very well, and the volume will be of real value to workers in many different branches of science, and not least to medical research workers.

R. K.

**STARLING'S PRINCIPLES OF HUMAN PHYSIOLOGY.**—By C. Lovatt Evans, D.Sc., F.R.C.P., F.R.S. Fifth Edition. London: J. & A. E. Churchill, 1930. Pp. XV plus 1039 with 543 illustrations, 9 in colour. Price, 21s. net.

THE fifth edition of Starling's *Principles of Human Physiology* will be welcome to all students and teachers of the subject. Physiology has advanced with such rapid strides during the last few years that a new edition of the book embodying all the recent advances was urgently called for, and this has been produced by Professor Lovatt Evans. It is indeed pleasing to note that the present edition fully maintains the place of honour which has so long been held by this book.

The subject-matter has been thoroughly re-adjusted and the whole chapter on the central nervous system has been re-written by Professor Hartridge. All the new researches on vitamins, endocrines, reticulo-endothelial system, etc., have been incorporated without increasing the bulk of the book. Many new diagrams have been added and some of the older ones replaced by new ones. The printing and format are excellent and there cannot be any hesitation in recommending the book to students as well as to general practitioners.

R. N. C.

**BEAUTIFUL FLOWERS OF KASHMIR. VOL. II.**—By Ethelbert Blatter, S.J., Ph.D., F.L.S. Illustrated by Mrs. G. A. Wathen, and Haldar Joo Wall. London: John Bale, Sons and Danielsson, Ltd. Price XV plus 204. Price, 21s. or Rs. 15-12 net.

THIS volume is likely to make a strong appeal to the minds of all those who are artistically inclined. The book is rich in exquisite tricolour pictures of plants and flowers which cannot fail to be appreciated by those who are interested in the flora of Kashmir—the Garden of Eden of India. The botanists will also find enough food in the various chapters—the habitat of the plants, their characteristics in relation to altitude and environment, the season for flowering, etc., are all very useful information for them. The derivations and meaning



of the different botanical names, the glossary and the index of popular names will be very helpful to readers. It is a pity that the medicinal properties of these plants and flowers could not be dealt with for want of space—this feature would have made the volume still more acceptable to the medical men.

R. N. C.

**MAN'S PLACE AMONG THE MAMMALS.**—By F. Wood Jones, F.R.S. London: Edwin Arnold & Co., 1929. Pp. VII plus 372. Price, £1-1-0.

THIS is a contentious work, which traverses debatable ground throughout, and, to any reader not in the full swing of the current of up-to-date mammalian systematics, presents ideas considerably at variance with the accepted zoology of his student days. The subject, however, is presented to us so fully and explicitly that the plain biologist and medical man can follow the argument without masses of previous collected reading, and the argument throughout appears convincing, though we have no doubt that it will be fiercely attacked by the author's fellow specialists who hold divergent views. To the ordinary non-specialist scientific reader it will give a much clearer concept of much modern research that, if he sees it at all, he sees in detached special articles in such publications as *Nature*; and, though by no means light reading, the book is so full of fascinating information that it forms a welcome change from one's own special line of study.

The book opens with a chapter on "the need for a review of the question of human phylogeny," from which we quote the following:—".....it is wellnigh impossible to obtain a satisfactory insight into the details of accepted beliefs, unless some regard is paid to the sequence in which theories have been accepted and dogmas become current." This consideration naturally leads on to two chapters on pre-Darwinian and Darwinian biological thought, in the latter of which it is shown that what passes for Darwinism to-day (and not all of us have read *The Origin* in detail) is coloured by the later views of Haeckel, Huxley, etc., and is far more dogmatic than the original statements of the great biologist himself. The next chapter deals with a study of function in regard to structure, and is followed, in support, by a brief chapter on some of the recent work in experimental embryology—a closed book to most workers, and another on the inheritance of acquired characters, that is too condensed and contentious. The next chapter, on "convergence," is too condensed for anyone who has not studied the delightful book by Willey, but sets out further cases not touched on by that writer which are germane to the present thesis. This opening portion of the book concludes with three chapters on "Man's place in Nature" before, during, and after the Darwinian period. Having digested the 67 pages just summarized, the reader is presumed to be sufficiently up-to-date to tackle the main thesis.

Now comes the shock. In some 75 pages the author shows, and shows very clearly, that the *Lemuroides* are not precursors of the monkeys, but are the shrews (*Trpoides*) modified by convergence to superficially resemble the *Pithecoidea*, which have, at the base of their phylogenetic tree, that "living fossil" *Tarsius*. A detailed account of what is known of this rare wild animal is followed by accounts of the New and Old World monkeys, showing how they probably arose separately from fossil Tarsioid stocks, and that the Old World monkeys and Anthropoids themselves diverged very early from a common ancestor. This thesis occupies another 150 pages. The final 70 are occupied with Man, and the author stamps ruthlessly on "missing links" and anthropoid characters in *Homo*, and derives that genus as a direct branch from a Tarsioid ancestor. The case made out is certainly at least a good one.

With expert palaeontological knowledge, the author tears down the faith that has been put in some of the fossil remains of recent discovery. We are so apt to see a tooth or a jaw bone given an important generic and specific name that we are inclined to think as if the entire skeleton of the animal were known. We can see

the author being fiercely attacked by specialists, but to the plain biologist his arguments are extremely convincing.

The chapters on skeletal and internal structure, and on habits of all the species discussed, are extremely interesting and valuable, whilst the book is illustrated by an excellent series of photographs of the animals themselves, in addition to very numerous text figures. Our immediate progenitor, *Tarsius*, in Plate III, Fig. 1, was such a jolly little beast that no one need feel distressed at having him, instead of the gorilla, at the top of their family tree!

R. S. W.

**FABLES AND SATIRES.**—By Sir Ronald Ross, K.C.B., K.C.M.G., F.R.S. London: Harrison and Sons, Ltd. Pp. III plus 71. Price, 7s. 6d. net.

ALTHOUGH most of us have been taught early to conceal from the world's gaze that minute part of our inner selves which we know to be singular, the dullest can bring into the public market, if he will, one unique thing, one commodity new and surely interesting, himself.

The psychologists nowadays are beginning slowly to show us how harmful a practice is repression, and here is one, a great scientist, who by his perseverance and hard common sense has given untold benefits to millions of his fellow men, wise enough to offer to the world that precious residue of himself that was left over from the day's toil, a residue which lesser men discard, if ever they recognize its worth, but which he in his wisdom preserved.

Sir Ronald Ross has done well to publish these verses, and among them will be found nothing that can be confused with the work of that School of Poetry which, largely by its self-advertisement, has been so conspicuous since the outbreak of the Great War.

As a poet he belongs assuredly to the right wing, and to-day his verse might be called reactionary, and this is very far from being a slur. He may not possess "that large utterance of the early gods," but he is not obsessed with the state of his own nerves, nor does he look on the writing of verse as an exercise in introspection. It is not his delight to veil meaning in an inspissated mist of deliberately perverted words, nor to sacrifice his clarity of communication to a syncopated rhythm that can be distinguished by the writer alone, and which, if one is bold enough to attempt it, will convey only a headache to the reader.

In spite of several instances of the printed word being tortured into a shape unnatural and unnecessary, he tries to give words their right uses, and that by itself will earn the gratitude of lovers of the English language. It is not the part of a critic only to find fault; a far more worthy asset is to be capable of recognizing sincerity in the writings of others, and here, in these verses, certain technical weaknesses may be forgotten in the originality of the poet's themes, his sudden flashes of wit, and the obvious feeling that inspired their birth. The book is worth reading, and worth keeping, not so much because it is especially remarkable in single pages, which is why no quotations are given, as because by its help we can reach out and come into touch with a charming personality, and follow a great scientist and a great benefactor when, wearied with the chase of the wily Anopheles, he turns to the pursuit of the equally elusive anapest.

A. R. U.

**THE PRACTICAL MEDICINE SERIES, 1928.**—Edited by G. H. Weaver, M.D., L. Brown, M.D., and others. Chicago: The Year Book Publishers. 1928. Pp. 832. Price, \$ 3.00 net.

"THE Practical Medicine Series," comprises eight volumes on the year's progress in medicine and surgery. *General Medicine* by H. Weaver, L. Brown, G. Minot, W. Castle, W. Strond and R. Brown of the 1928 series, and published by The Year Book Publishers of Chicago, is one volume of the series. This volume consists of five parts dealing with the infectious diseases prevalent in

America in Part I, diseases of the chest in Part II, diseases of the blood, hæmopoietic system and kidney in Part III, diseases of the heart and blood vessels in Part IV, and diseases of the gastro-intestinal system and metabolism in Part V. The book is handy and contains all the necessary information in connection with the treatment of all the important diseases that prevail in America. In some cases the various therapeutic measures are very well discussed. The book will be useful to medical practitioners.

S. P. B.

**METHODS AND PROBLEMS OF MEDICAL EDUCATION. THIRTEENTH SERIES. VANDERBILT UNIVERSITY SCHOOL OF MEDICINE, NASHVILLE, TENNESSEE.**—Pp. 130. Profusely illustrated. New York, The Rockefeller Foundation.

EVERY Dean, if not every Professor, of a medical school or college in India should be interested in this wonderful and very valuable series of publications. The Rockefeller Foundation have made a splendid contribution to the cause of medical education by their issue, for they consist of brief and fully illustrated accounts of different clinics, medical schools and colleges, laboratories, and methods of teaching from different parts of the world. The articles on different departments are written by the men in charge of them, and illustrated by photographs. The complete series thus comprises a set of volumes comparing present-day methods of teaching, investigation, and research in many different countries.

The present—thirteenth—series deals with the Vanderbilt University School of Medicine, and opens with a general account of this school by Dr. G. Canby Robinson and an aeroplane view of the buildings. Vanderbilt University was founded in 1873 as the result of a grant of a sum of one million dollars by Cornelius Vanderbilt, but the medical school was in financial difficulties until Mr. Andrew Carnegie and the General Education Board came forward with financial assistance in 1913–1919. Finally a new hospital and medical school was built in 1925, and the entire department reorganized.

The chief interest of this lavishly illustrated memoir is that it presents a detailed account of a completely up-to-date American medical school intended for thorough medical education of a small number of students. The professor at an Indian medical college, who has to deal with hundreds of students annually, may well envy the professors at Vanderbilt University, where the number of students is limited to 50, and there are 208 beds in all in the different wards. What is aimed at here is thorough education of selected men, not mass production of "doctors," as in India. And the photographs of the different departments show how thoroughly this plan is adhered to. The medical curriculum follows that usually in vogue, though a special feature is that third year students are assigned to the various wards in groups so as to gain a thorough training in methods of examining patients, before they are told off in their fourth year to different divisions of the out-patient department.

Successive chapters in the volume deal with the organization, planning, and work of the different departments; library, anatomy, biochemistry, physiology, bacteriology, pathology, medicine, pediatrics, surgery, obstetrics, etc., and the school of nursing. A novel and very interesting departure is a central apparatus shop for the whole school for the repair of instruments, microscopes, apparatus, etc., an innovation much needed in medical colleges in India. The library is designed to hold 35,000 volumes, and takes in 284 current medical periodicals; it also has separate reading and work rooms. In connection with the anatomy department special courses are given in histology and neurology; there is also a special tissue-culture room. The biochemistry department is a model of what it should be, and will interest every laboratory director in India; it includes a constant temperature room. In all the departments separate laboratories are provided for routine, teaching, and research work, and the "unit" system is largely followed, one and two-unit laboratories being provided.

Throughout the volume detailed plans of the different departments and laboratories are given. The research

department of the pharmacology section consists of twelve rooms, and is obviously very spacious. The section of preventive medicine has a special research laboratory for parasitology. The clinical laboratories adjoining the wards appear to be spacious—an essential only too often forgotten by architects when designing hospitals. Pediatrics is given a separate department to itself. The surgical section has a separate instrument room, also laboratories for work in experimental surgery, and a technician's room. Finally a separate School of Nursing trains nurses and grants a degree in nursing.

The professor at any Indian medical college may well study this brochure with interest. We would also commend it to the Finance Departments of the different Indian provinces. This is what is considered suitable provision for fifty medical students in a new and up-to-date medical school in America.

A limited number of copies of the volumes in this series are available on application to The Rockefeller Foundation, 61, Broadway, New York, N.Y., and if any dean of a medical school or college in India is having trouble with his local Finance Department, we would advise him to study the series.

Finally, we must recognize the great value of the publication of this series of brochures by the Rockefeller Foundation, for the result must be to further the cause of medical education and research work by the collation of information with regard to buildings, equipment, and methods.

R. K.

**SLEEP AND THE TREATMENT OF ITS DISORDERS.**

—By R. D. Gillespie, M.D., M.R.C.P., D.T.M.  
London: Baillière, Tindall and Cox. 1929. Pp. IX plus 267 with 5 figures in the text. Price, 7s. 6d. net.

IN this small volume the author has tried to give a concise and a clear account of the various phenomena associated with sleep, without going into controversial details. The book opens with a general survey of the normal physiological phenomena of sleep. Then follows a comprehensive description of the various effects of insomnia and of the types of disorders associated with sleeplessness, all views being based upon experimental and clinical observation. The author then gives in detail the methods which can be employed to combat these disorders and discusses the rationale on which they are based. The pharmacology and therapeutics of the hypnotics are briefly discussed, and the methods employed are classified according to the different types of sleeplessness. The volume is admirably adapted to serve as a book of reference to the general practitioner in dealing with a most troublesome symptom.

R. N. C.

**INDIAN THERAPEUTICS FOR MEDICAL STUDENTS AND PRACTITIONERS.**—By D. V. Sandu, G.P.A.S. (Bom.), L.M.S., etc. Second Edition (Revised and Enlarged) Bombay: D. K. Sandu Bros. 1928. Pp. VII plus 147. Price 7 annas. Foreign 1s. 6d. net.

*Indian Therapeutics* by Dr. D. V. Sandu is an attempt to present the main facts of Ayurveda on the lines of Western medicine. At the very outset, the "Tridosha Theory"—the foundation on which the whole superstructure of Ayurvedic system rests—has been discussed and the author tries to explain it in views of the modern scientific discoveries. Various drug-combinations and Ayurvedic formulæ are incorporated in the body of the book and it is expected that these will be of some use to junior practitioners of the indigenous system. The chapters on dietetics and vitamins are interesting and have been written entirely from the modern European point of view. The book is full of misprints and typographical errors and the general get-up is very poor. It appears to be too elementary for medical practitioners and the utility of the book is doubtful.

R. N. C.

**A DIET SUMMARY IN AVERAGE SERVINGS FOR DIABETICS AND OTHERS SUFFERING FROM DISORDERS OF METABOLISM.**—By P. J. Cambridge. London: Baillière, Tindall and Cox. Pp. 8. Price, 1s. net. (6s. per dozen).

THE system of dieting adopted by the author in this brochure appears to be suitable and easy for the average diabetic patient to carry out.

The author has given 4 tables:—

"A" which is predominantly protein, and "B" which is predominantly carbohydrate, in composition; "C" is mainly fat, and "D" contains a good mixture of the various nutritive principles. Each of these tables is further subdivided into "groups" according to the amount of protein, carbohydrate or fat it contains in an "average serving." An arbitrary unit has been adopted, such as 1 protein-ration (P. R.) which means 20 grams of protein; 1 carbohydrate-ration (C. R.) equals to 4 grams of carbohydrates; and 1 fat-ration (F. R.) means 5 grams of fat. Thus, according to the quantity (in grams) of protein, carbohydrate, and fat allowed to the patient, he can make a selection of his diet by the use of these tables.

In our opinion the tables are simple and practical, and will be found useful in breaking the monotony of the average diet of diabetic patients.

J. P. B.

## Annual Report.

**PUBLIC HEALTH ADMINISTRATION OF THE PUNJAB FOR THE YEAR 1928.** BY LIEUT.-COL. C. A. GILL, D.P.H., I.M.S., DIRECTOR OF PUBLIC HEALTH, PUNJAB. LAHORE. SUPERINTENDENT, GOVERNMENT PRINTING, PUNJAB, 1929. PRICE RS. 3-12-0.

COLONEL GILL's report for 1928 is of special interest in showing that, in spite of unusual vagaries of climate, the year achieved the distinction of being the healthiest ever recorded in the history of the Province. There were unusually severe dust storms in March, which were responsible for a partial failure of the wheat crop; an unusually hot and dry May; a prolonged break in the rains from 23rd July to the last week in August, and excess of rainfall in September. As a result the prices of wheat and barley were slightly above normal, though the prices of food grains of less value were normal or below normal. On the other hand, the low winter rainfall was unfavourable to plague, and the autumn was healthier than usual.

The estimated population at the end of the year was 22,285,553, and the increase in population during the year—442,696, is the highest figure ever recorded for the Province. The Province, however, can absorb even an abnormal increase in population for several years to come, in view of the extension of canal irrigation and the formation of new canal colonies. A serious feature of the position, however, is the excess of males over females; this calls urgently for an extension of the very considerable volume of maternity and child-welfare work which is already carried out in the Province.

The provincial death rate was 21.58 per mille, and the birth rate 46.30, the difference between the figures, 21.58 per mille, being the highest such figure on record for the Punjab. The unusual healthiness of the year is to be attributed chiefly to the low incidence of plague and of malaria. Infant mortality was also unusually low, 167.62 per mille, as compared with the quinquennial average of 193.57. As is well known, the Punjab heads the list of the Indian provinces in the birth rate and natural increase of population. The rise in the birth rate was conspicuous in all parts of the Province, and is attributed to the absence of malaria in epidemic form. The mortality from malaria and plague was unusually low. As is usual in years when

great epidemics of these diseases are absent, the urban death rate, 26.92, exceeded the rural death rate, 24.46. As usual, the death rate was highest at the extremes of life, in infancy and in old age. As a community, Hindus appear to be slightly more susceptible to disease than do Mahomedans.

It has hitherto been impossible to entrust the work of registration of vital statistics to the district medical officers of health, as these officials have not yet been provided with the necessary clerical staff. Revised forms for the registration of births and deaths in rural areas were introduced in April, 1928. Entries checked in birth registers during the year numbered 778,372, and deaths, 459,048; but the fines inflicted on defaulters are so trivial that they tend to defeat the purpose for which they were inflicted.

Turning to the principal diseases, *cholera* was responsible for 2,034 deaths, and a mortality of 0.10 per mille, as compared with the quinquennial average of 0.17. *Cholera* is not known to be permanently endemic in any part of the Punjab, and the infection appears to be always imported. The widespread epidemic which followed the Hardwar Fair in 1927 came to an abrupt conclusion in October of that year, and no case was reported until March, 1928, when a small outbreak occurred at Rohtak owing to importation of infection from Calcutta. A fresh wave of infection occurred among the pilgrims attending the Sun Eclipse Fair at Thanesar in November; 38 cases occurred during the fair and 203 cases among pilgrims returning from the fair.

There was a very sharp outbreak in Mandi State. This was almost certainly due to importation of infection from the Hardwar Fair of 1927, but no intimation of the existence of *cholera* in this area was received until 31st March, 1928, as the State has no public health service. During the first week of April there were 36 cases with 26 deaths, and in the middle of the month at Baijnath 28 cases with 18 deaths among a labour force engaged in the construction of the Kangra Valley Railway. These two outbreaks were speedily suppressed, and at the end of April it appeared that all danger was over. Only once during the previous 61 years had *cholera* been epidemic in the Kulu Valley. Unfortunately carriers from Mandi State must have carried the infection into Kulu Valley, as in May a sudden and explosive epidemic broke out, and persisted till August. There were 1,746 seizures with 1,164 deaths; figures which show how heavy *cholera* mortality is amongst a primitive people. Unfortunately news of this outbreak did not reach the Director of Public Health until 5th June. Immediate assistance was rushed to this somewhat inaccessible and remote spot, and the most vigorous measures taken. Fortunately, as a result of these measures, the epidemic was stayed and both the Simla Hill States, and Simla and Ambala were protected. It has now been decided to station a small public health staff permanently in the Kulu Valley to deal with future emergencies, and to prevent the heavy loss of life inseparable from an epidemic which is able to obtain a firm hold on the population before the necessary measures to check it can be taken.

The seasonal periodicity of *cholera* during the year showed peculiar features, for the maximum prevalence was in June, instead of as usual August, whilst a second fresh wave of infection occurred in the cold weather months of November and December. The preventive measures at the Thanesar fair in November were very successful; in Kulu no one could have anticipated a severe epidemic, and the difficulties in combating *cholera* in this remote region were very great.

*Smallpox* accounted for 8,764 deaths, or a mortality rate of 0.43 per mille, as compared with the quinquennial rate of 0.40. The disease was as usual more frequent in the urban than in the rural areas, and at its maximum prevalence as usual during the months of May and June. It is hoped that Simla and Lahore will shortly be provided with fully staffed and equipped smallpox hospitals.

For the second year in succession, the incidence of *plague* was unusually low—9,922 deaths in the British

districts, and 1,640 in adjacent areas. The death rate from this disease was 0.40 per mille in the former, as against a quinquennial average of 4.44 in the previous five years. The disease as usual assumed its epidemic form in March throughout the epidemic area. In August not a single death from plague was reported, whilst it recurred later in only mild epidemic form. Colonel Gill attributes the check which the epidemic spread of the disease received during the year largely to the dust storms of 4th to 7th March, associated with a rapid decline of atmospheric humidity. He gives the chief features of the epidemiology of plague in the Punjab during the year as having been progressive shrinkage of the endemic area, combined with a tendency of the disease to persist in the relatively humid districts in the foothills of the Himalayas; the low diffusibility and intensity of the epidemic; its early and complete decline in June, and the restricted character of its recrudescence in the autumn. It actually proved possible during the year to reduce the anti-plague staff, a most notable fact when the previous history of plague in the Punjab is considered. (It would seem clear that the results of decades of vigorous anti-plague measures may now be becoming apparent.)

The fever death rate, as mentioned previously, was unusually low, 15.41 per mille as against the quinquennial average of 20.17. This was due, in part to a welcome absence of influenza in January and February, and chiefly to the unusual climatic conditions of the year, and the very low incidence of malaria in the autumn. *Dysentery and diarrhoea* accounted for a mortality rate of 0.51, as against a quinquennial average of 0.54. The incidence was unusually heavy in the Rawalpindi district.

As elsewhere in India, and especially in the western half of India, where extremes of climates prevail, *respiratory diseases* are an important cause of mortality; death rate 2.57 per mille as against a quinquennial average of 2.55. The greatest mortality is in the winter months, and the urban death rate greater than the rural one. Influenza is partly responsible, and that chiefly in the sub-montane tract, but Colonel Gill is of opinion that respiratory diseases take such a toll of lives in the Punjab that vigorous measures should be taken against them. A special point which he raises—and, in our opinion, one of great importance—is the slackness of municipal committees with regard to house planning; plans are passed which create conditions of insanitation and absence of ventilation which are bound to lead to the widespread propagation of respiratory diseases. He rightly calls attention to the *laissez faire* policy in India with regard to this important aspect of public health.

Colonel Gill's report also includes the Report on Sanitary Works for 1928 by Rai Bahadur Amar Nath Nanda, B.A., M.E., Superintending Engineer, Public Health Circle, Punjab.

Colonel Gill's report closes with certain forcible remarks on the problems of public health administration in a large Indian province, which are of such interest that we quote them below *in extenso* :—

"The year was, it has been shown, an exceptionally healthy year, and, in spite of some disappointments, it is possible to regard with chastened satisfaction, the advance made along the strait and narrow road to Health.

The first stage in the organization of a provincial public health service has been completed, some progress was made in adjusting the administrative machine to the requirements of scientific governance; the efficiency of the department, as well as the demands made upon it, showed unmistakable signs of steady and healthy expansion and last, but not least, the attitude of the public, from the Legislature downwards, towards public health measures was uniformly encouraging.

On the other hand, it is clear that a beginning—only a small beginning—has been made, that some sanitary problems have not yet been envisaged, let alone tackled, and that the provision made for public health measures, both centrally and locally, falls far short of requirements. Indeed, the provincial expenditure upon public

health (after deducting departmental receipts) fell from Rs. 20.9 lakhs in 1926-27 to Rs. 12.8 lakhs in 1927-28.

It is difficult to create an A-1 department with the aid of a C-3 budget, but apart from the question of funds, the manner in which an ever-increasing measure of local self-government can be squared with efficiency in the sphere of public health, is a source of anxious concern. Local Government—of which public health is the very bone and marrow—has not yet passed the first instar and it will need the best efforts of statesmen to discover a *via media* which will provide necessary direction and guidance without unduly interfering with local administrative control.

It is not so much a question of *policy* as of *pace*, but so long as local bodies are amenable to the malign influence of communalism—that cancer of the body politic—so long will counsel be darkened and action paralysed in the sphere of public health.

But these and other disabilities may be only 'growing pains' and it is well, in concluding this report, to take an optimistic view and to dwell upon the evidence contained in this report that, so far as circumstances permitted, a sustained effort was made to meet the pressing needs of the moment and to lay the foundations of future progress. That it is possible to make this statement is largely due to the loyal co-operation and assistance of Assistant Directors, District Medical Officers of Health and all ranks of the department."

The general comment offered on the report by the covering resolution of the Ministry of Self-Government in the Public Health Department, is as follows :—

"Government have read with interest the report of the Superintending Engineer, Public Health Circle, from which it is clear that a large number of sanitary works of public utility have been constructed or are under construction. Reference has already been made to the special water supply scheme for the Thanesar fair, and in addition many other water supply and drainage schemes have been completed. The completion of such schemes is, however, a beginning only, and it is on the successful maintenance and working of the schemes by the local bodies concerned that the safety and convenience of the public depend. Government have read with grave concern the remarks of the Director of Public Health to the effect that several instances came to notice during the course of the year of the complete ruin of costly plants owing to the negligence of the local body concerned, and one or two particularly glaring cases are already under the consideration of Government. Government desire once again to emphasize the personal responsibility of members of local bodies for loss and waste which are the immediate result of their culpable negligence, and where such culpable negligence is established, the liability to make good the loss will be enforced. It is regrettably obvious that local bodies in a large number of cases fail to make adequate financial arrangements for the maintenance of their water-works. All such schemes should be made self-supporting, and that this is not the case at present is clearly brought out in the report. A piped supply of pure water is one of the greatest blessings that can be brought to the homes of the dwellers in towns, rich and poor alike, and a very moderate water tax coupled with the metering of all private connections is sufficient to provide all necessary running costs with a reasonable margin for repairs and replacement. The Urban Sanitary Board has now drawn up a suitable model set of bye-laws for water supply, and Government will in future not sanction any grant for the construction of water-works until they are satisfied that these bye-laws will be accepted and duly enforced.

The vital importance to the life of the Province of adequate public health arrangements in every sphere of the department's activities cannot be exaggerated, and it is impossible within the confines of a short review to express the considered views of Government on all the important matters dealt with in the report. Attention has been directed to certain of the more pressing matters, and for the rest Government must leave the report to speak for itself.

Government have read with pleasure the list of sanitary works of public utility executed by individuals throughout the Province and desire that their appreciation should be conveyed to the gentlemen concerned.

Government desire to thank Lieutenant-Colonel C. A. Gill for an interesting report and for a year of progress and good work generally. Lieutenant-Colonel Gill has earned a reputation extending beyond the Province as an expert on all matters concerned with epidemics, and his strenuous labours over a number of years are undoubtedly bearing fruit. The district medical officers of health, of whom there is now one in every district except Simla, are proving their value by the prompt measures they are able to take whenever an epidemic appears, and it is an instructive fact that the only place in the whole Punjab where an epidemic was not tackled and suppressed as soon as it appeared was the isolated valley of Kulu which had no public health staff at all, a defect which Government have now arranged to remedy."

## Correspondence.

### THE ORGANISM OF BOVINE LYMPHANGITIS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I beg to enclose a letter which has been addressed to the Editor, the *Indian Veterinary Journal*, Madras.

As many of your readers may not see that journal, I should esteem it a favour if you would kindly publish the letter also in your paper.—Yours, etc.,

L. A. P. ANDERSON, MAJOR, I.M.S.,  
Offg. Director.

HAFFKINE INSTITUTE, PAREL, BOMBAY,  
15th January, 1930.

"Letter dated Bombay, the 15th January, 1930.

From Major L. A. P. Anderson, I.M.S., *Officiating Director, Haffkine Institute, Parel, Bombay.*

To the Editor, 'The Indian Veterinary Journal,' 26, Wallajah Road, Mount Road, Madras.

SIR,—My attention has been drawn to a paragraph under notes, page 6, Vol. VI, No. 1, July, 1929, of the *Indian Veterinary Journal*, which runs as follows:—'A great discovery indeed is the one made by Mr. V. Krishnamoorthy Iyer, I.V.S., that the organism of bovine lymphangitis is identical with the *B. pestis*. We learn that it has been accepted as such after proper test at a conference of the medical men at the Haffkine Institute, Bombay.'

The statement that 'it has been accepted as such after proper test at a conference of medical men at the Haffkine Institute, Bombay' is incorrect. No bacteriological study of the organism of bovine lymphangitis has as yet been carried out in this Institute, and as such its identity with *B. pestis* has not been established by any of the officers of this Institute. I therefore request you to publish this disclaimer in your next issue."

### VOLVULUS OF THE SMALL INTESTINE.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I was much gratified by your letter promising early publication of my article on volvulus of the small intestine (*Indian Medical Gazette*, January, 1930, p. 9).

In my article I limited myself to certain aspects of the problem of spontaneous recovery. There are others which I could not write about without becoming too speculative; e.g.:—

Are some of these cases due to enterospasm?

What is the nature of the common intestinal colic of India?

What is the best treatment for obstruction, when operation is refused? Some use purgatives with atropine

in large doses; others pituitrin and eserine; others again rely on repeated enemata.

I wish you could find others to write on the subject. It seems to me to be of considerable practical importance. These cases are so frequent that many Indian practitioners advise against operation altogether (though I am sure that they are wrong). I myself am by no means sure whether repeated enemata before operation are desirable or not; it is surprising how often they succeed, but they involve dangerous delay and exhaustion when they fail.—Yours, etc.,

R. C. M. McWATTERS, M.B., F.R.C.S.,  
LIEUT.-COLONEL, I.M.S.

C/o GRINDLAY & Co., LONDON,  
15th December, 1929.

### THE TREATMENT OF MALARIA.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—It is with the greatest diffidence that I write on the subject of the treatment of malaria, as it has been proved beyond doubt that in quinine we possess a specific remedy for successfully combating this disease. Unfortunately, however, the half starved masses cannot be made to take the "safe dosage of 30 grs. daily for two to three weeks, 20 grs. daily for a month, and 10 grs. daily for two months," on account of the bitter taste, giddiness, deafness, and other complications that occur.

No one questions the importance or success of anti-malarial measures, but until these are started in real earnest all over the country, our duty as medical practitioners ought to be to relieve our patients as quickly as possible by medicines which they have the least objection to taking.

During 1929 I have treated over 4,500 labourers for malaria, and it is my experience that though they do not doubt the efficacy of quinine, they are very reluctant to take it in sufficient quantity on account of its unpleasant after-effects. So, instead of administering quinine bihydrochloride in full doses, I have reduced the dose to 2 grs. at a time twice daily. To it, however, I add quinidine sulphate, grs. 1½. This is given in pill form, and extract nucis vomica and ferri arsenas are added in suitable doses. Podophyllum resin and phenolphthalein are also added when the patient complains of chronic constipation.

The results obtained so far have been so highly encouraging, especially in fever of tertian type, that I take the liberty of writing this, hoping that others in the same situation will give it a fair trial and report their experience in your journal.

The following three cases (out of many) are of sufficient interest to show the efficacy of quinidine sulphate.

Case 1.—Mrs. R. B. M., European female, 40 years. Arrived from England on 17th September, 1929. Fever on 2nd November, 1929, with malaria parasites in the blood films. Full doses of quinine orally for three days, without effect. Quinine bihydrochloride, gr. 10, injected daily for three days. The fever stopped on 10th November, 1929. Patient continued quinine in 30 gr. doses a day for one week. Fever recurred on 20th November, 1929. Quinine administered orally, and continued to 27th November, 1929. Fever again on 30th November, 1929. Quinidine sulphate commenced from this date and continued up to 10th December, 1929. Has had no fever since the 1st December.

Case 2.—Mr. P. S., European male, aged 35 years. Fever, with malaria parasites in blood films, on 6th October, 1929. Three injections, each of gr. 10 of quinine bihydrochloride, followed by quinine orally for ten days. Fever again on 18th October, 1929. Full doses of quinine by the mouth for one week. Fever again on 2nd November, 1929. Given quinidine pills, and this was continued up to 15th January, 1929. Has had no fever since the 3rd November.

Case 3.—Mrs. S., Mahomedan female, aged 60 years. Fever off and on since August, 1929. Could not be induced to take a quinine mixture. Quinidine pills given



on 10th October, 1929, and continued for a fortnight. Has had no fever since the 12th October.—Yours, etc.,

BHUPENDRA K. CHATTERJEE, B.Sc., M.B.,  
Medical Officer.

ADAMJEE JUTE MILLS, BELUR.  
18th January, 1930.

(Note.—The "safe-dosage" referred to by our correspondent appears to us to be excessive. Present day tendency, we believe, is to abandon the immense, heroic, and long continued courses of quinine which were given in the past. Dr. Chatterjee is in accordance with old and well established opinion, however, in advocating arsenic and iron during convalescence, and in paying special attention to constipation. The reviewer's present practice is to administer Sinton's alkalies and quinine treatment for a continuous period of 12 to 14 days; 30 grs. of quinine a day if the patient will take it, 20 grs. a day if he will not. This is followed by one month's treatment, with one Tabloid after each meal, of Burroughs, Wellcome & Co.'s Tabloid Ferri Citras Co., the formula of which is:—

Ferri et Ammonii Citras	..	gr. 3
Quinina Sulphate	..	gr. 1
Acidi Arseniosi	..	gr. 1/60th

(sugar-coated).

It is probable that the administration of quinine never completely eradicates all the malaria parasites in a patient's blood stream; but if the parasite population can be brought below the febrile threshold by quinine administration, then a prolonged course of arsenic, iron, and quinine in small doses will so improve the hæmatinic system that the patient's own powers of resistance will eradicate the few remaining parasites. At least such a line of treatment appears to be preferable to the prolonged and drastic courses of quinine treatment of the past, with their accompanying misery to the patient, who suffers more from the quinine than he ever did from the malaria.—EDITOR, I. M. G.)

#### AN EPIDEMIC IN RATS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—Rats have been dying here in large numbers for the past one and a half months. Smears of blood from the heart and spleen were sent to the Director, Haffkine Institute, Bombay, and were declared to be free of plague infection. The Principal, Veterinary College, Bombay, is of opinion that the disease from which the rats have been dying is an atypical form of plague. No human case has been recorded to date.

I remember to have read some time ago in the *Indian Medical Gazette* that rats may die under epidemic conditions from a disease called sarcosporidiosis, which is not communicable to human beings. Do you think that the present mortality among rats may be due to this disease? If the mortality is due neither to plague nor to sarcosporidiosis, can any of your readers suggest through your columns the possible cause of such an epidemic in rats?—Yours, etc.,

S. R. INGLE,  
S. M. S. Officer.

CIVIL HOSPITAL, RATNAGIRI,  
23rd December, 1929.

(Note.—Sarcocystis infection, as a rule, does not give rise to symptoms, though it is recorded in the literature that mice and rats may die from the infection. The parasites especially affect the striated muscles; usually those of the skeletal muscles, but also the heart, larynx, tongue, and diaphragm. Full descriptions of the parasites, whose exact systematic position is still uncertain, are given by Wenyon in his *Protozoology*, and by Knowles in his *Medical Protozoology*, p. 333. It does not seem likely that sarcosporidiosis will account for the epidemic. Leptospira infections in rats are usually believed to be symptomless, though the same is by no means the case in experimentally infected guinea-pigs. Whether Pasteurella infections occur in the rat we do not know; but if this was the cause it would certainly not have been overlooked by the Haffkine Institute.

Perhaps some of our veterinary readers—if any—might make suggestions?—EDITOR, I. M. G.)

#### GANGRENOUS STOMATITIS FOLLOWING DYSENTERY.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I request you to kindly publish this record of a case of gangrenous stomatitis following an attack of bacillary dysentery in your correspondence columns.

The patient, a boy aged about 3 years, was suffering from bacillary dysentery for about a fortnight before the onset of gangrenous stomatitis. General debility was probably the predisposing cause. It is usually considered that this rare disease occurs during convalescence from acute fevers, most commonly after measles and infrequently after scarlet fever and typhoid fever. As the occurrence of this condition as a sequel to bacillary dysentery is rare, it may be of interest to the profession in this country.—Yours, etc.,

T. S. NAIDU, L.M. & S. (Hyd.),  
Private Practitioner.

RAICHUR, HYDERABAD STATE,  
20th December, 1929.

(Note.—Gangrenous stomatitis is not a very rare condition; it is a sequel of several of the debilitating diseases of children. This fact is not always remembered by practitioners in Bengal at least, who administer the treatment for kala-azar in a very large percentage of such cases, whether the previous history is suggestive of that disease or not.—EDITOR, I. M. G.)

#### MYCETOMA IN RAMNAD.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In your editorial in the August, 1928, number of the *Indian Medical Gazette*, I find Ramnad District mentioned as a district where mycetoma is common. I beg to state that none of the hospitals in this district have recorded a single case of endemic origin of mycetoma infection for many years. During the last three years only the Virudunagar and Ramnad hospitals have had cases, and the hospital statistics show that between 1925 and 1927, 7 cases were treated in Ramnad, and 4 in Virudunagar. These all came from outside the district.—Yours, etc.,

T. S. ADISUBRAMIAN, M.B., B.S., B.S.C.,  
District Health Officer.

5th November, 1928.

(Note.—We regret that this letter was not published earlier. It had been "referred for opinion" elsewhere and overlooked.—EDITOR, I. M. G.)

## Service Notes.

#### APPOINTMENTS AND TRANSFERS.

IN modification of Education, Health and Lands Department Notification No. 510-H., dated the 14th March, 1929, Lieutenant-Colonel (now Colonel) C. A. Sprawson, C.I.E., M.D., F.R.C.P., V.H.S., I.M.S., Principal and Professor of Medicine, King George's Medical College, Lucknow, is appointed to officiate as Inspector-General of Civil Hospitals, United Provinces, with effect from the 11th March, 1929, and is appointed permanently to that post with effect from the 16th March, 1929.

Lieutenant-Colonel A. D. Stewart, M.B., F.R.C.S.E., I.M.S., Professor of Hygiene, School of Tropical Medicine and Hygiene, Calcutta, and officiating Principal, Medical College, Calcutta, and Superintendent of the College Hospitals, is placed on foreign service under the Indian Research Fund Association for employment as Director designate of the Public Health Institute, Calcutta, with effect from the 1st October, 1929.

On return from leave, Lieutenant-Colonel W. L. Harnett, M.B., F.R.C.S., I.M.S., was re-posted as Superintendent, Campbell Medical School and Hospital, Calcutta,



with effect from the afternoon of the 15th December, 1929.

Lieutenant-Colonel F. E. Wilson, I.M.S., an Agency Surgeon, on return from leave is posted as Residency Surgeon, Kashmir, with effect from the 19th December, 1929.

Lieutenant-Colonel V. N. Whitmore, O.B.E., F.R.C.S. (Eng.), I.M.S., is appointed to be Civil Surgeon, Simla (West) with effect from the 1st March, 1930.

Major J. P. Huban, O.B.E., I.M.S., an officiating Agency Surgeon, is confirmed as an Agency Surgeon under the Government of India in the Foreign and Political Department.

The services of Major M. Fazluddin, O.B.E., I.M.S., are placed temporarily at the disposal of the Government of the Punjab for employment in the Punjab Jail Department with effect from the 1st January, 1930.

On relief by Major S. S. Sokhey, I.M.S., Major W. J. Webster, M.C., I.M.S., Officiating Assistant Director, Haffkine Institute, Bombay, is attached to the Institute as Supernumerary Officer with effect from the 6th December, 1929.

On reversion from the cadre of Agency Surgeons under the Government of India in the Foreign and Political Department, the services of Major M. Fazluddin, O.B.E., I.M.S., are placed at the disposal of the Government of India in the Home Department with effect from the 1st January, 1930.

On return from leave Major A. C. Craighead, I.M.S., an officer of the Medical Research Department, is posted as a Supernumerary Officer at the Central Research Institute, Kasauli, with effect from the date on which he assumes charge of his duties.

#### LEAVE.

Major G. Covell, M.D., I.M.S., an officer of the Medical Research Department, who was granted combined leave for thirteen months under Education, Health and Lands Department Notification No. 2200-H., dated the 20th December, 1928, is permitted to return to duty on the 6th September, 1929, and the unexpired portion of his leave on half average pay is cancelled.

Lieutenant-Colonel B. Higham, I.M.S., Chemical Analyser to the Government of Bombay, is granted leave on average pay for seven months with effect from 15th April, 1930, or date of availing.

Lieutenant-Colonel D. G. Rai, I.M.S., District Medical Officer, South Kanara, is granted leave on average pay for fifteen days from the 3rd January, 1930, with permission to prefix the holidays from the 21st December, 1929, to the 2nd January, 1930, to his leave.

Major J. A. Sinton, V.C., O.B.E., I.M.S., Director, Malaria Survey of India, Kasauli, on foreign service under the Indian Research Fund Association, is granted leave on average pay for 2 months in India with effect from the 1st January 1930 or subsequent date on which he may avail himself of the leave. His services are placed at the disposal of the Director-General, Indian Medical Service, with effect from the date on which he proceeds on leave.

Major G. C. Maitra, I.M.S., Officiating Assistant Director, Central Research Institute, Kasauli, is granted leave on average pay for 8 months combined with study leave for 6 months with effect from the 1st September, 1929.

#### PROMOTIONS.

##### Major to be Lieutenant-Colonel.

A. N. Palit, F.R.C.S.E., I.M.S., dated 29th July, 1929. The promotion of the undermentioned officers to the rank of Major is ante-dated to the dates mentioned:—

T. S. Shastri, M.B., dated 1st February, 1926.  
Ranjit Sen, dated 7th August, 1928.

##### Captain to be Major.

J. W. F. Albuquerque, M.B., dated 22nd December, 1929.

#### RESIGNATION.

Lieutenant W. McCoach, M.B., I.M.S., relinquished his probationary appointment from the 24th October, 1929.

#### RETIREMENTS.

Colonel W. S. Willmore, M.D., I.M.S., with effect from the 7th August, 1929.

Lieutenant-Colonel J. W. Watson, C.I.E., C.B.E., I.M.S., from the 8th November, 1929.

Lieutenant-Colonel J. Forrest, I.M.S., with effect from the 4th November, 1929.

Major M. Prasad, I.M.S., dated 28th October, 1929.

#### NOTIFICATION.

Officers who are now serving on temporary commissions in the Indian Medical Service and have been gazetted to temporary rank have been granted substantive rank on their temporary commissions equivalent to and in substitution for the temporary rank so gazetted, except in the case of temporary rank granted to officers in consequence of their being called upon to perform the duties of a rank higher than their substantive rank.

## NOTE.

### PITUITARY EXTRACT. "B. D. H."

AN interesting little brochure, which we have received from the British Drug Houses, Ltd., gives an account of the methods of testing and uses of this preparation. The method of standardisation employed is that recommended by the Medical Research Council, and consists of testing the effects on the uterus of a virgin guinea-pig, as compared with the effects of a similar preparation obtained in accordance with the procedure recommended by the International Committee on the Standardisation of Biological Products. The graph reproduced shows that the "B. D. H." preparation is of equal, or slightly superior, value to the standard preparation; a response is obtained in dilutions of the order of 1 : 10,000,000. A second test is to test the pressor action on the blood-pressure of a decapitated cat. Both tests show that the preparation is fully active.

The uses of this preparation are numerous. In inducing labour repeated small doses may be given together with castor oil orally. It is of value in surgical shock, in intestinal stasis, as a safeguard against hemorrhage in operations on the nose and throat, in the polyuria of diabetes, in insulin hypoglycæmia, and in heart failure where an immediate effect is required. It is put up in ampoules for intramuscular injection in two strengths, 10 and 4 international units respectively.

The brochure contains a useful list of references from the literature, and will be of interest to our readers.

## Publishers' Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 reprints *gratis*, if asked for at the time of submitting their manuscripts.

Communications on Editorial Matters, Articles, Letters and Notices should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o The Calcutta School of Tropical Medicine, Central Avenue, Calcutta.

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## Original Articles.

### FORECAST OF THE PROBABLE MAJOR VARIATIONS IN CHOLERA, SMALL-POX AND PLAGUE IN INDIA DURING 1930, BASED ON THE METEOROLOGY OF 1929.

By Sir LEONARD ROGERS, Kt., C.I.E., M.D.,  
F.R.C.P., F.R.S.,

MAJOR-GENERAL, I.M.S. (ret'd.).

(Received for publication 23rd February, 1930.)

As the result of three very laborious years' study of some sixty years' sanitary and meteorological records for all parts of India, I showed that the major epidemics of small-pox, cholera and plague are dependent on antecedent meteorological variations which makes it possible to forecast them several months before their development with a fair degree of accuracy. Such a correct forecast based on my methods was actually made by the sanitary officer in the Southern Deccan in the case of the cholera epidemic of 1927, and that in Sind in 1929 so clearly followed very deficient rainfall during the previous monsoon and winter months, that I presume it was also foreseen by the sanitary authorities in accordance with the previous similar sequence of events in 1885 and 1892, pointed out in my memoir on cholera incidence (*Indian Jour. Med. Research*, 1928).

Working in London I am handicapped by receiving the vital statistics and meteorological data some two months later than they are available in India, but in order to put my theories to a very rigid test I propose to publish forecasts of the probable major variations of the three great epidemic diseases of India, in the hope that should they prove in any degree correct during the next three years or so, the method may subsequently be taken up under the more advantageous conditions obtained in India itself. That such forecasts may be of great practical value is proved by the fact that in the case of the South Deccan cholera epidemic of 1927 the divisional sanitary officer warned the authorities some time before the appearance of any cholera in his districts that on the rules laid down by me in 1926 the failure of the previous monsoon rains, combined with the high degree of susceptibility due to the practical absence of cholera from that area during the previous two years, rendered an epidemic of cholera very probable. Moreover, as soon as the first few cases appeared he advised the prohibition of a local pilgrimage, but the authorities decided that it was too late to do so, and severe cholera broke out at this fair, and although subsequent fairs were prohibited, a widespread epidemic followed, which was apparently the origin of an outbreak in the Persian Gulf soon

after, which, but for our presence in Iraq, would probably have spread to Europe with appalling results in Russia, as happened in 1851-53. My full memoir had not then been published or it would have been possible to foresee the South Deccan outbreak with practical certainty at least a month before its occurrence by the exceptionally favourable 1927 high spring absolute humidity in the South Deccan as shown on page 105 of my memoir, and it is of great interest to record that I was fortunate enough to meet the head of the first infected district, who agreed with me that had he received longer warning based on the high absolute humidity data, he could have prohibited the incriminated fair in time to check the outbreak. This example should suffice to convince the sanitary authorities in India that my methods are at least worthy of their attention.

*Meteorological data of 1929 unfavourable for forecasts.*—Fortunately for India the monsoon rains of 1929 were remarkably well distributed, for the only material defect in the British Provinces, with which alone I deal, was the moderate deficiency of 16 per cent. in the United Provinces, and the only significant excess was due to heavy rains on the North-West Frontier and in Sind in July, which is less important from my present point of view than in the later monsoon months. My forecast this year will therefore be mainly of a negative character, but not necessarily less valuable, should a forecast of the absence of epidemics over most of India prove correct.

#### CHOLERA INCIDENCE.

*Factors influencing.*—These were fully described in my memoir and are briefly: (1) Low monsoon and winter rains of the previous year, (2) a high degree of susceptibility due to absence of recent epidemic prevalence, and (3) a favourable absolute humidity of about 0.400 and over at the time of the usual seasonal increase of cholera in the particular area. The first two sets of data are available some months before an outbreak, the third is only known shortly before, so only the first two can be used in this forecast, although the third is also important to watch in some areas. In my memoir I showed that no less than 40 out of 41 epidemics in India during 45 years had been preceded by deficient rains, and the one exception was due to high spring absolute humidity in a twelve-yearly Allahabad Kumbh Fair year, which Fair has recurred once more in 1930. I also showed that cholera does not spread in periodic waves from Bengal as held for a century, for the yearly incidence curves over 45 years are different in Assam, Eastern Bengal, Western Bengal and in Bihar, as well as in the East and the West of the United Provinces, which forms one huge north-eastern endemic area, while South-East Madras and the West Coast of Bombay are distinct endemic areas from which cholera also spreads as in 1875. Smaller areas than provinces

have therefore to be dealt with in making a forecast, and the most important of these are shown in Table I, in which a — sign indicates previous low cholera incidence and low monsoon rainfall respectively, which are favourable to increased cholera, and + signs have the opposite significance. Two signs, such as — —, indicate high degrees and single signs, such as —, only moderate departure from the normal, and it is only the major degrees that indicate severe epidemics, and it will be noted that they are practically absent as regards rainfall from Table I

the Surma Valley of Assam, and low prevalence in Sind after last year's epidemic, due to failure of the 1928 monsoon and the ensuing winter rains. With the important exception of Bihar and the United Provinces, no great departure from the average of the last ten years is to be expected in the other areas dealt with, although I have ventured to indicate the direction which such slight variations may be expected to take, although I recognize that in view of the slight departures from the normal monsoon rains there is only a reasonable probability of their being

TABLE I.

*Forecast of probable cholera incidence in India in 1930.*

Area.	PREVIOUS PREVALENCE. MONSOON 1929.					Forecast.
	1927.	1928.	1929.	6—9.	10.	
E. Bengal .. ..	+	?	—	+	—	About average incidence.
W. Bengal .. ..	+	?	—	—	+	do.
Assam Valley .. ..	+—	—	—	++	+	Average to somewhat low.
Surma Valley .. ..	+	—	—	—	—	Moderate increase over average.
Orissa .. ..	+—	+	+—	++	—	Average to somewhat low.
Bihar .. ..	—	++	+—	—	++	Climatic conditions normal. Allahabad Kumbh Fair will cause considerable excess.
E. United Provinces ..	+—	+	+—	+—	+—	Low September rains favour cholera. Allahabad Kumbh Fair will cause excess. This may be great if winter rains fail or if February and March absolute humidity is in excess as in 1894.
W. United Provinces ..	+—	+—	—	—	+—	Deficient monsoon rains favour cholera, so excess following that in E. United Provinces to be feared.
Punjab .. ..	++	—	—	+—	—	Moderate increase over average.
N. W. F. P. .. ..	—	—	—	++	+—	No excess unless Punjab much infected.
E. Central Provinces ..	+—	—	—	++	+—	Good rains. Average to low unless infected by Allahabad Kumbh Fair.
W. Central Provinces ..	+—	++	—	+—	—	Average to low unless infected from Bombay Deccan.
Bombay Deccan .. ..	++	—	—	—	+—	Average to some excess.
do. Konkan .. ..	+—	—	—	+—	+	Average to low.
do. Gujerat .. ..	—	—	—	+—	+—	Average unless infected from Deccan.
do. Sind .. ..	—	—	++	++	+—	Low after 1929 epidemic and good monsoon.
Madras Deccan .. ..	+—	++	—	—	+—	Average to some excess.
N. E. Madras .. ..	+—	+	—	+—	+	Average to low.
S. E. Madras .. ..	+—	+—	+—	—	—	Average to some excess.

owing to the favourable 1929 monsoon. A + — sign indicates no material variation from the normal. As in Assam and Bengal the cholera season commences during the last three months of the year, the forecast relates to the period from October 1929 to September 1930 and in South-East Madras from December to November. Table I will allow the data regarding previous cholera prevalence and the 1929 monsoon rainfall in each area and their probable influence on 1930 cholera incidence to be seen at a glance, and in view of the practically normal rainfall in most of them affording little likelihood of great departures from the average it is unnecessary to discuss them all in detail. An increase over the average of the last ten years may be expected in

fulfilled. The deficiency of the latter part of the monsoon rains in the West of the United Provinces is of greater importance than usual owing to the Allahabad Kumbh Pilgrimage in January and February 1930, for although I pointed out in my memoir this occurrence does not usually seriously infect the western United Provinces divisions owing to its occurring when the absolute humidity is too low for epidemic cholera in the west, yet should the epidemic prevalence of cholera in the east of the United Provinces, which has followed each of the four previous Allahabad Kumbh Fairs from 1882 to 1918, recur in 1930, the western divisions are more likely to be infected on account of their 1929 low rainfall. Should the winter rains be deficient in the United

Provinces the danger will be enhanced in both parts of the province.

*The 1930 Allahabad Kumbh Fair and Cholera in Bihar and the Eastern United Provinces.*—In Chart XIII of my memoir I demonstrated that the cholera incidence curves during 35 years in Bihar and the Eastern United Provinces ran closely parallel owing to main rises occurring in the Allahabad Kumbh Fair years, and in those with very deficient monsoon rains affecting both areas. Moreover, I showed that the extent of the Kumbh epidemics from 1882 to 1918 was dependent on the rainfalls and the January to March absolute humidity, and not on the excellent sanitary measures at the fairs since 1894, which only deal with two or three square miles out of some 100,000 square miles of the endemic cholera area of the two provinces, through whose insanitary villages and towns some 3,000,000 pilgrims pass to and from the Fair. The fact that the 1882 Fair, with no proper sanitary precautions at the Fair site, caused less cholera than the next three fairs, with good sanitation at the camp, suffices to prove this obvious inference. I also showed that the high cholera incidence in 1894 as compared with that of 1882 was due to the exceptionally high and favourable absolute humidity at the time in 1894 compared with exceptionally low readings in 1882 (*see p. 129 of my memoir*). The extent of the 1930 epidemic will largely depend on whether the absolute humidity in Western Bihar and Eastern United Provinces is well below the critical level of 0.400 in January to early March this year as in 1882, or whether it approaches that level, as in the bad cholera year 1894, as well as on whether the winter rains are good and so less favourable to high cholera incidence. These data are not yet available in London at the time of writing in the last week of January, but they will be available to the sanitary authorities by the time this forecast appears, so this crucial point is referred to in Table I and will largely determine the extent of the cholera epidemic, which is apparently inevitable in Bihar and the Eastern United Provinces this year, and which may affect to a less extent the West. Owing to the favourable monsoon rains in the Eastern United Provinces and Bihar, unless the absolute humidity in January to March is in excess of the normal, the cholera epidemic due to the Kumbh Fair of 1930 is likely to be less severe than in 1894, 1906 and 1918.

#### SMALL-POX.

*Factors influencing yearly incidence.*—A comprehensive study of the monthly provincial small-pox variations in India in relation to meteorology during 48 years was published by me in No. 106 of the *Special Report Series of the Medical Research Council*. I there showed that the yearly decline in the disease during the rains in the seven provinces most affected by the south-west monsoon was related to the high

absolute humidity at that season, and that the small-pox epidemics which occur mainly in the north-west and central part of India are related to comparatively low monsoon absolute humidity due to partial failure of the monsoon rains in the previous year, but in the less affected damp areas of Bengal, Assam and Madras low autumn absolute humidity favours subsequent increased small-pox prevalence. Another important factor is the prevalence of the disease during the previous few years, as in a year immediately following an epidemic, favouring low absolute humidity will have comparatively little effect in causing another rise; on the other hand after a series of four or more years of low small-pox a considerable rise may occur, due to the accumulation of susceptible persons, in the absence of specially favourable low absolute humidities. Only considerable variations from the average absolute humidities are of value in forecasting epidemic increases.

*Meteorological conditions during 1929.*—The remarkably well distributed monsoon rains of 1929 naturally resulted in only slight variations in the monsoon absolute humidity in most of the provinces of India, consequently few material variations from the average small-pox prevalence in 1930 are to be expected. The monthly distribution of the rains, as well as their totals, affect the average absolute monsoon absolute humidities; it is for this reason that the humidity data are the more important in making forecasts. The provincial variations of the 1929 absolute humidities which mostly affect the next year's small-pox are given in Table II, together with the small-pox incidence of recent years, and their probable bearing in the incidence of the disease in 1930 is indicated.

*Discussion.*—Only variations of about 0.030 to 0.050 and over from the average absolute humidities are closely related to small-pox variations in any particular province, so in absence of very high degrees in any of the data, which are based on the figures of a representative place in each province, no severe epidemic of small-pox is likely to occur in India during 1930. Bihar and Orissa, the North-West Frontier Province and the Central Provinces show moderately low absolute humidities, which are liable to be followed by some increase of small-pox over the average of the ten years 1919–28 given in Table II, but in the case of the North-West Frontier the fact that small-pox has been fairly prevalent in three out of the four previous years makes it unlikely that the increase, if any, will be material. The same remark applies to Bihar and Orissa, and the year as a whole presents unusually indefinite data on which to base a reliable forecast.

In Madras and Burma the small-pox incidence is most closely related to the absolute humidity from November to January which is not yet available.

TABLE II.  
Forecast of probable small-pox incidence in India in 1930.

Province.	10 years' average.	Previous Prevalence.			ABSOLUTE HUMIDITY.			Forecast.
		1927	1928	1929	Months.	Average.	Variation from normal.	
Assam .. ..	0.42	0.76	1.23	0.09*	10—11	0.675	— 0.008	Average to low.
Bengal .. ..	0.42	0.9	0.25	0.1*	10—11	0.726	— 0.007	Average to low.
Bihar and Orissa ..	0.40	1.0	0.4	0.1*	10—11	0.588	— 0.038	Average to some excess.
United Provinces ..	0.12	0.17	0.07	0.13*	10—11	0.519	— 0.001	Average to some excess.
Punjab .. ..	0.37	0.48	0.43	0.18*	6—9	0.833	— 0.023	About the average.
N. W. F. P. ..	0.30	0.08	0.27	0.24*	7—9	0.708	— 0.045	Above the average.
Central Provinces ..	0.18	0.20	0.10	0.05*	6—9	0.710	— 0.037	Above the average.
Bombay .. ..	0.24	0.27	0.27	0.46*	6—10	0.676	— 0.006	About the average.

\* The 1929 rates are based on the available figures from January to November with the estimated prevalence in December. They are not likely to vary from the actual data by more than a point or two in the second decimal place.

#### PLAGUE.

*Factors influencing annual incidence.*—I recorded in 1928 the results of an elaborate analysis of the incidence of plague in relation to climate during thirty years in different areas of India (*Proc. Royal Soc., B.*, Vol. 103, p. 42). This paper, as well as those already mentioned on cholera and small-pox, were sent to all the Directors of Public Health in India. The climatic factors which showed the closest relation to plague incidence proved to be the average mean temperatures in the hot and rainy seasons, and the saturation deficiencies at all four seasons of the year, making six yearly data to be studied, four of which are available before the annual increase of the disease about December in North and Central India, but in the Bombay Deccan the rise of plague occurs during the later monsoon months owing to the mean temperature being then too low to inhibit the disease in that area. Only northern India and the Central Provinces can therefore be dealt with in this forecast, and as the disease is absent or negligible in Assam and Bengal this leaves Bihar and Orissa, the United Provinces, the Punjab and the Central Provinces. The four climatic factors of the previous year which mainly influence the disease in any year in these areas are the monsoon temperatures, and saturation deficiencies of the hot weather and monsoon seasons, and that from October to December, but only the first two months' figures of the last are available at the time of writing. Saturation deficiency is obtained by deducting the monthly absolute humidity from the saturation point at the mean monthly temperature; it is a measure of the drying power of the atmosphere, high degrees of which, as well as high

temperatures, are inimical to the life of the rat-flea carriers of plague infection. The average monthly figures I worked out for thirty years of these data enables the degree of excess or deficiency to be calculated for any year, and as high temperatures and high saturation deficiencies, indicated by + signs in Table III, are unfavourable to subsequent high plague incidence, and *vice versa*, a considerable preponderance of + signs indicates the likelihood of low subsequent plague, and a series of — signs indicates the probability of subsequent increase of plague over the average of recent preceding years. Two ++ and two —— signs respectively indicate a well marked variation from the normal, and a single + or — sign only a moderate variation of much less significance, so that unless some double signs appear in the table no great change in the plague incidence is to be expected. The climatic data as far as they are available for 1929 are given in this manner in Table III and the deductions from them are indicated. It must also be remembered that, just as with small-pox, after a year or two of high plague incidence any factors favouring high plague incidence will have less effect than after some years of low incidence. Owing to the multiplicity of the factors, plague forecasting is more complicated and difficult than that of cholera and small-pox and my full paper should be studied by any one attempting this task.

*Forecast.*—It will be seen from Table III that in no province during 1929 were the climatic conditions very favourable or unfavourable to plague prevalence during 1930, such as was shown by a great preponderance of — or + signs in years of high and low incidence in the tables in my former paper. There is only then

TABLE III.

Forecast of plague incidence in 1930 in North and Central India; saturation deficiencies.

Province.	Monsoon Temperature.	In Hot Season.	In Monsoon Season.	October—November.	Forecast.
Bihar and Orissa ..	+—	++	++	+—	Below the average.
United Provinces ..	+—	+	+—	+—	About the average.
Punjab ..	+—	+	—	+—	Average to slight excess.
Central Provinces ..	+—	++	+—	++	Below the average.

*Note.*—High saturation deficiency in January to March and high mean temperatures in March and April lessen the incidence of plague, and *vice versa*. The above forecast will be influenced by any material departures from the normal in these respects in the climatic conditions in the early months of 1930.

a fair degree of probability of moderate variations of plague during 1930 in the directions indicated in the table, namely rather low incidence in Bihar and Orissa, and especially in the Central Provinces, and possibly slight excess in the Punjab.

As a whole 1930 is likely, if my forecast is fairly correct, to be one of no very great variations of cholera, small-pox and plague in India from the average incidence of the last decade, except the regularly recurring twelve-yearly Allahabad Kumbh Fair cholera one in Bihar and the United Provinces.

### THE *ANOPHELES STEPHENSI* PROBLEM IN CALCUTTA.\*

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THE seasonal prevalence of *Anopheles stephensi* Liston has been studied in Calcutta for one year, viz., from July 1928 to June 1929, in an area almost one square mile in extent in Central Calcutta, with a view to studying this complex problem and the best methods of control of this notorious malaria carrier species of anopheline in Calcutta, the second city of the British Empire. The area under survey is bounded on the north by Mechuabazar Street and Cotton Street; on the south by Bowbazar Street, Lalbazar Street and Dalhousie Square North; on the east by Amherst Street; and on the west by Charnock Place and Clive Street. It consists of ward 8, and parts of wards 7 and 9. According to the latest census in 1921 the population and number of occupied houses in this area were as follows:—

	Population.	Number of houses occupied
Ward 7 ..	32,959	4,530
Ward 8 ..	38,510	7,125
Ward 9 ..	69,670	15,115

\* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad January, 1930.

The prominent places of public importance in this area are the Bengal Secretariat buildings, the premises of the Calcutta School of Tropical Medicine, the Medical College and allied hospitals, Calcutta University, the Presidency and



Fig. 1.—Sketch map of the area of Calcutta surveyed.

Sanskrit Colleges, the Marwari Hospital, the Indian Association for the Advancement of Science, the Royal Exchange, and a large number of banks and mercantile offices. Fig. 1 gives a map of the area in question.

The land may be considered to be more or less flat, though it has a very slight slope towards



the east. It has filtered and unfiltered water supplies and underground drainage. The land is of alluvial soil, but its upper surface, except the *busti* areas and open lands, is covered with cement under the houses, and pitch on the roads. The area is occupied mostly by Bengali Hindus and Marwaris and Mahomedans, together with very few members of other communities, and the houses comprise densely aggregated Indian quarters and residential quarters of *busti* type. There is one big tank in the area—College Square tank.

During the period of observation the temperature rose as high as 106.2°F. in March. March to June are the hot months with maximum temperature varying from 104°F. to 106.2°F. The minimum temperature fell as low as 52.7°F. in February. The minimum relative humidity, taken at 4 p.m., rose as high as 95 per cent. in July and September, and fell as low as 22 per cent. in March. The total rainfall of the period was 54.86 inches. Appendix I gives a more detailed record of the meteorological observations.

No detailed survey of malaria or of the mosquitoes in Calcutta city has hitherto been published. In 1898 Sir Ronald Ross recorded that there was but little human malaria in Calcutta. In 1901 Professor Stephens and Col. Christophers made some observations on the anopheline mosquitoes and malaria of Calcutta. They recorded the spleen rate as zero, and found *A. rossi* and *A. fuliginosus*. Here it should be mentioned that *A. stephensi* was first described by Liston only in 1901. In February 1900 Sir Leonard Rogers studied the relationship of the drinking water, water-logging, and the distribution of Anopheles mosquitoes to the prevalence of malaria north of Calcutta along the bank of the Ganges. In Chitpur-Cossipore he recorded the spleen rate as 11.2 per cent., the smallest figure obtained for any of the municipalities examined, a finding which he explained by the fact that this municipality had a filtered water supply, though water-logging was most abundant in this area.

In the same year Dr. Neild Cook investigated the connection between the presence of Anopheles mosquitoes and malaria in the city of Calcutta. In three months he found 89 tanks with abundant anopheline larvae. In 1902, Col. S. P. James, in his report on "Malaria in India," first recorded *Anopheles stephensi* Liston in Calcutta. He examined 140 children and found a spleen rate of zero, and dissected 352 anopheline mosquitoes but found none infected. In 1907 the late Dr. Annandale found *A. stephensi* in the gardens of the Indian Museum. Alcock, Lloyd, Burkill, Bentham, Adie, Daniels, Annandale, James and Liston, and Brunetti collected 8 species of Anophelines and some Culicines from Calcutta—the results being recorded by Theobald and Brunetti. In 1906-7 Dr. B. Brahmachari carried out observations on malaria and anophelines in Chitpur-Cossipore. He

found four species of Anophelines in this area, viz., *A. rossi*, *A. fuliginosus*, *A. sinensis*, and *A. barbirostris*. Dr. U. N. Brahmachari made some observations on the anophelines breeding in the Campbell Hospital; he collected some larvae from an old tub, which were bred out into adults, and identified by Col. Christophers as *A. stephensi*. In 1912 Col. Fry reported on the history of malaria in Calcutta, noting that the place had been very malarious from the commencement of the British occupation, and studying early records of the days of the East India Company. In the same year Mr. Paiva published a paper on observations of the mosquitoes of the fringes of Calcutta. He did not record any *A. stephensi*.

An enquiry into the prevalence of *Aedes aegypti* (*Stegomyia fasciatus*) in different parts of India was ordered in 1912 by the then Director-General, Indian Medical Service, and from August 1912 to January 1913 Major McGilchrist made a *Stegomyia* survey of the port of Calcutta. In 1913 Col. James published a paper on the practicability of *Stegomyia* reduction in Indian sea ports, with a view to the protection of India from yellow fever. In this connection he studied the conditions in Calcutta, and suggested the provision of a constant high pressure water supply as the first step that should be taken to reduce these mosquitoes. In 1915 Col. Christophers, on instructions from the Director-General, I. M. S., visited Calcutta to advise with regard to the best methods of carrying out a survey of the *Stegomyia* problem in Calcutta. He suggested an improved water supply, as an intermittent one leads to water storage and *Stegomyia* breeding. In 1915-1916 Dr. Nandy carried out observations with regard to *Stegomyia* in two typical selected areas in Calcutta.

In 1916 Col. Christophers pointed out the necessity for a complete scientific survey on Calcutta city, extending over five years and dealing with all mosquitoes which carry disease, and this measure was endorsed by a special conference convened to frame a scheme for securing better sanitary control over the port of Calcutta and its environs. This survey, however, has never been carried out. In 1920 Mr. M. O. T. Iyengar published a preliminary report on malaria in Calcutta city; he recorded *A. stephensi* breeding in the city, and found spleen indices of from 2 to 10 per cent. in the suburbs. In 1922 Dr. S. N. De collected 1,460 anopheline mosquitoes from Districts III and IV of Calcutta; he found 1 per cent. of them to be *A. stephensi*. The reports of the Health Officer of the Calcutta Corporation for 1922 to 1927 state that the death rate from malaria varied from 1.1 to 1.6 per mille during these six years, the maximum number of deaths from this disease being generally recorded in December.

\* \* \* \* \*

In the present instance an *Anopheles stephensi* survey was carried out once a month for twelve months in the area described. Out of 4,119 likely breeding places, larvæ were found in 1,131, the total number of larvæ collected being 27,498. The largest catches of larvæ took place in July, and the lowest in December. A detailed monthly record of larvæ, breeding places, and their percentages is given in Appendix II.

The buildings, *busti* huts, etc., from which *A. stephensi* were collected may be classified under the following twelve headings, being placed in order of importance:—

- (x) Mahomedan mosques.
- (xi) A church.
- (xii) Hindu hotels.

Although occupied buildings heads this list, it should be mentioned that the number of *busti* huts in the area reported on is but a very small fraction of the number of pukka buildings. The detailed monthly record is given in Appendix III.

In all twenty-one types of receptacles were found to be breeding *A. stephensi*; these are shown in Fig. 2.

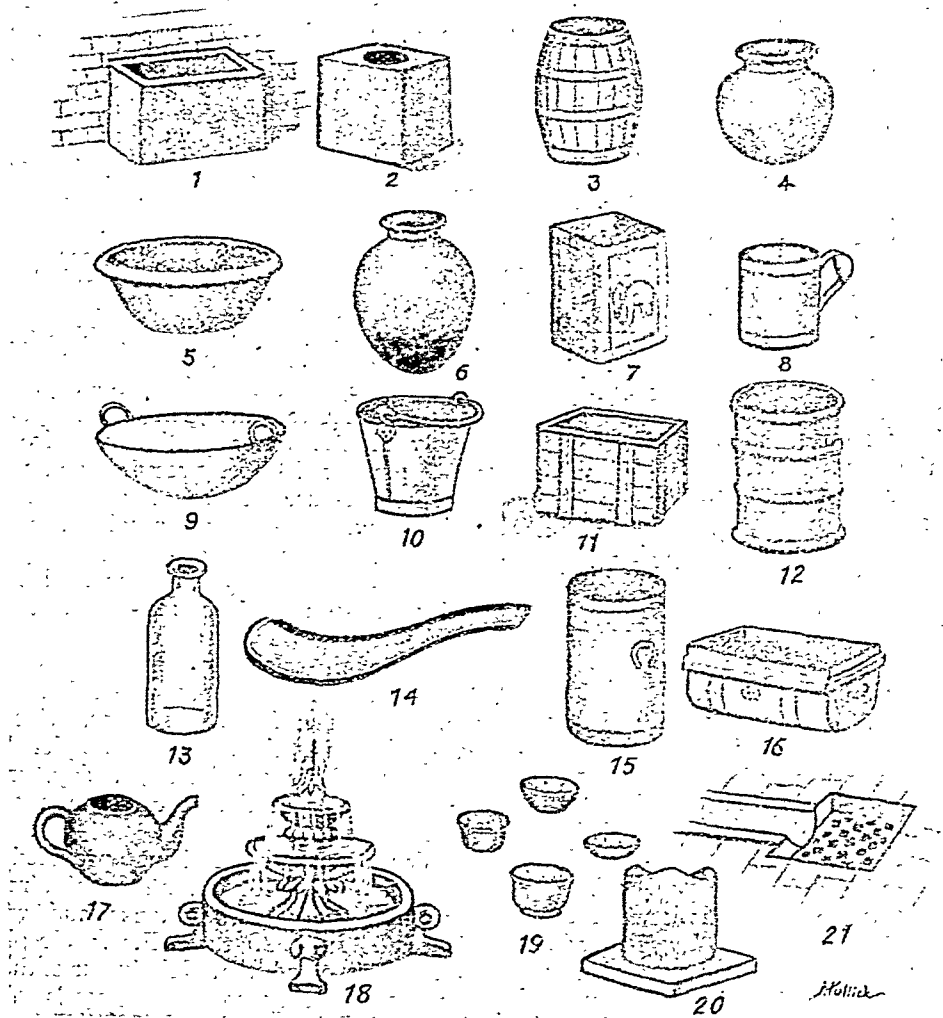


Fig. 2.—Types of breeding places of *Anopheles stephensi* in Calcutta.

- (i) Occupied buildings.
- (ii) *Busti* huts.
- (iii) Dyeing and cleaning firms.
- (iv) Waste land and gardens.
- (v) Roads.
- (vi) Mahomedan hotels.
- (vii) Stables.
- (viii) Buildings under construction.
- (ix) Restaurants.

The detailed monthly record with reference to these is given in Appendix IV. The receptacles concerned were as follows:—

(1) *Choubachas*.—These are masonry reservoirs for the storage of filtered water; they vary in size, but generally have a capacity of from 50 to 500 gallons, or more. During the year 982 of these were examined, and 286 were found to harbour *A. stephensi* larvæ. They were mostly

found in pukka buildings, and only a few in *bustis*, since a piped water supply to *busti* houses is but a recent development in Calcutta.

(2) *Cisterns*.—These are made of galvanized iron sheets of standard thickness, and are mostly used as reservoirs for storage of unfiltered water to flush latrines, etc. Every house has at least one on its roof; their capacity is proportional to the number of latrines in the house, the Corporation rules demanding a capacity of 60 gallons per latrine. In the area under consideration most of the buildings are old type Indian quarters; the kitchens are on the ground floor in the same block as the dwelling rooms; and middle class Indians, as a rule, instead of using gas or electric stoves, burn coke and wood for cooking purposes. As a result of the repeated warnings of the Smoke Nuisance Committee, pointing out the increasing number of cases of diseases of the lungs in Calcutta, and the damage done to permanent buildings by coke and wood smoke, the inhabitants of these buildings are gradually shifting their kitchens to the roofs of their houses. This results in an increased demand for filtered water on the roof, but, as the pressure of the filtered water supply is only a few feet in the city, people collect filtered water in a *chaubacha* in the ground floor and thence pump it into a cistern on the roof. On enquiry, the dealers in plumbing material and goods informed me that the sale of pumps and cisterns is rapidly increasing in the city. Thus, the introduction of roof kitchens may lead to smoke abatement, but, unless there is a sufficiently high pressure and a continuous one of filtered water, this will add to the danger of *A. stephensi* breeding in Calcutta. *A. stephensi* larvæ were collected from 162 out of 560 cisterns examined during the year.

(3) *Wooden barrels*, (4) *Earthen handis*, (5) *Earthen tubs*, (6) *Earthen jars*, (7) *Kerosene tins*, (10) *Iron tubs*, (15) *Iron barrels*.—These receptacles are used to a greater or less extent by the poorer classes of people for storing filtered water; some of them are discarded and rain water collects in them, and they thus form suitable breeding places for *A. stephensi*. Appendix IV shows the correlation between these types of receptacle and *A. stephensi* breeding. Some of the earthen tubs are used as garden tubs in which rain water is collected, whilst some of the iron tubs are used as fire buckets in buildings from which *A. stephensi* larvæ were collected.

Such receptacles such as (8) *tin mugs*, (9) *iron frying pans*, (11) *a wooden box*, (13) *a glass phial*, (14) *a motor mud guard*, (16) *a tin box*, (17) *a teapot*, (19) *cups*, and (20) *a deserted fireplace*, from which *A. stephensi* larvæ were collected, were usually found discarded and uncared for.

(12) *Pitch barrels* were mostly found by the roadside. After the pitch has been used up in repairing the roads, the empty barrels are not

promptly removed; this leads to the accumulation of rain water in them, and they thus become suitable breeding sites for *A. stephensi*.

(18) *Garden fountains* are not very common in the area. One of them was found breeding *A. stephensi*, however.

(21) *Pukka drains* have been found in some instances to breed *A. stephensi*, when they were found blocked by dirt and with the water stagnant. *A. stephensi* larvæ were not found in the tank in College Square. Appendix V shows the correlation between *A. stephensi* breeding receptacles and types of houses, etc.

\* \* \* \* \*

From the nature of the breeding places discovered and described, it is abundantly clear that the reservoirs of filtered and unfiltered water in the centre of Calcutta city are the main source of the *A. stephensi* breeding in the city. These constitute such danger with regard to malaria transmission as may exist; they present a very much more serious danger with regard to the transmission of dengue by *Aedes ægypti* (and even possibly of yellow fever, if introduced). James (1913) and Christophers (1915) have already stated that the intermittent and low pressure of the Calcutta water supply is the main cause of mosquito breeding in the city, and have suggested the obvious remedy. The Act of 1876 required the Calcutta Corporation to supply filtered water continuously from 6 a.m. till 9 p.m. at 10 feet pressure, and actually at 50 feet pressure between 7 and 9 a.m. and 5 and 6 p.m. The provision with regard to the obligation of the Corporation to supply a continuous water supply was included in a Bill, which subsequently became the Act of 1899. This measure was based on the experience of various engineering experts, who held that a continuous water supply resulted in a reduction of waste. Moore's scheme, which is now partly in operation, when completed, should yield 80 gallons per head per day, and should enable the Corporation to carry out the terms of the Act.

Calcutta city must have provided suitable breeding places for *A. stephensi* almost from time immemorial, when tanks and wells were plentiful. In 1820 the "Fever Hospital Committee" reported that Hindus use the Ganges water which they collect in vessels, and Europeans rain water which they collect in "Pegu" jars, whilst—in the absence of any knowledge of the life history of mosquitoes—it is most unlikely that such receptacles were kept covered.

\* \* \* \* \*

Chart (Fig. 3) shows the correlation between meteorological conditions and *A. stephensi* breeding in the area in question in Calcutta city. It will be seen that there is an exact correlation between the curve for rainfall and that for *A. stephensi* breeding. Between November and February the fall of the maximum temperature, minimum temperature, and minimum relative

humidity curves correspond extremely closely with the fall of the *A. stephensi* curve.

graphically in Chart (Fig. 4), and in detail in Appendix VI.

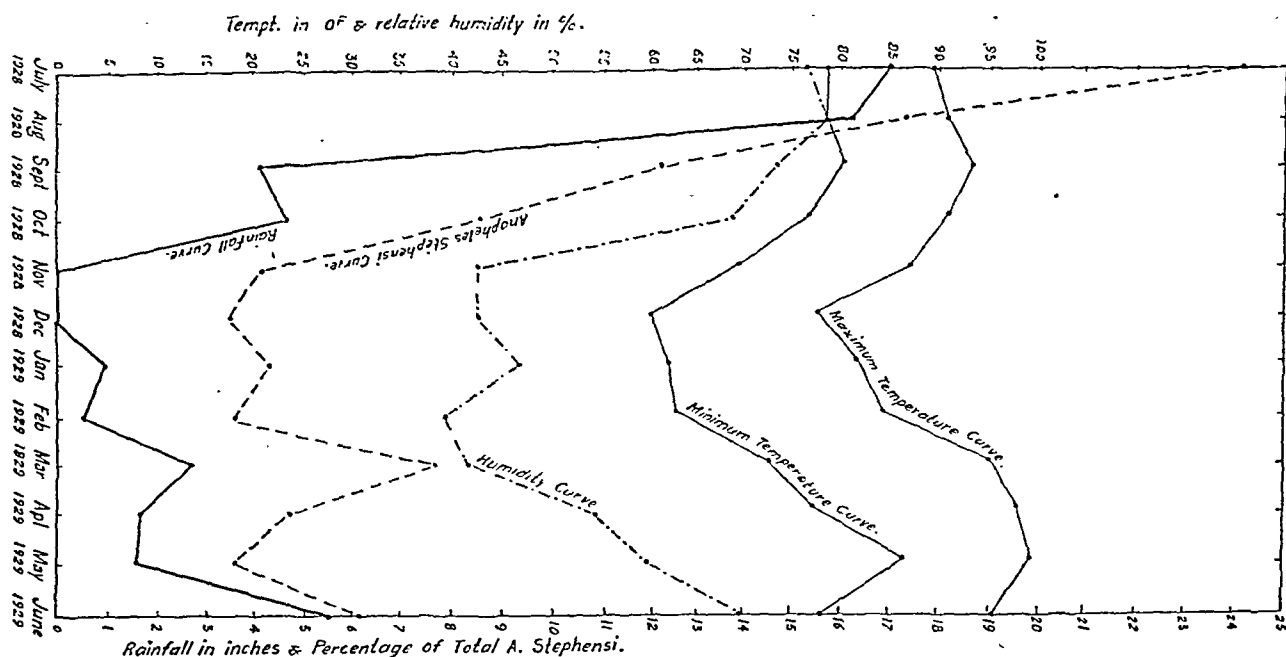


Fig. 3.—Chart showing minimum and maximum temperature, relative humidity, rainfall and *Anopheles stephensi*.

"Relative humidity"—which, for the purposes of this paper, is based on the wet and dry bulb readings at 4 p.m.—has been taken at a time daily when the relative humidity is very low. But for comparative purposes it can be used safely, as in every season of the year the relative humidity is low at that time of the day. The variation in the relative humidity from hour to hour during the day, and also the variations at different seasons of the year, are shown

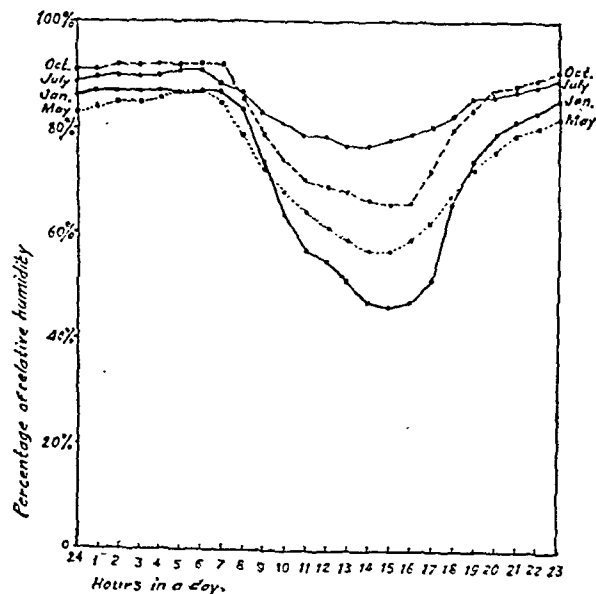


Fig. 4.—Chart showing the variation of relative humidity at different hours in a day in different seasons.

These values are derived from the records of the Alipore Observatory, and include wet and dry bulb temperatures extending over a period of twenty years; they can therefore be

#### APPENDIX VI. Normals of Relative Humidity.

Hours	JANUARY.	MAY.	JULY.	OCTOBER.
	Per cent.	Per cent.	Per cent.	Per cent.
24	86	83	89	91
1	87	84	90	91
2	87	85	90	92
3	87	85	90	92
4	87	86	90	92
5	87	87	91	92
6	87	87	91	92
7	87	85	89	92
8	84	79	87	86
9	74	73	83	79
10	64	68	81	74
11	57	64	79	70
12	55	61	79	69
13	51	59	77	68
14	47	57	77	66
15	46	57	78	66
16	47	59	79	66
17	52	62	80	72
18	66	67	82	80
19	74	73	85	84
20	79	76	86	87
21	81	79	87	88
22	83	80	88	89
23	85	82	89	90
Mean	73	74	85	82

## APPENDIX I.

*Meteorological records.*

Months.	Average maximum temperature. °F.	Average minimum temperature. °F.	Average wet bulb taken at 4 P.M. °F.	Average dry bulb taken at 4 P.M. °F.	Average relative humidity taken at 4 P.M. Per cent.	Total rainfall in inches.
July 1928 .. ..	80.93	78.33	80.58	86.58	76.74	17.02
August 1928 .. ..	91.37	78.85	80.57	86.2	77.83	16.26
September 1928 .. ..	93.62	80.22	81.4	88.41	73.35	4.13
October 1928 .. ..	91.07	77.16	77.76	92.45	68.35	4.60
November 1928 .. ..	87.22	69.98	69.01	84.43	42.83	0
December 1928 .. ..	78.00	60.33	64.86	79.00	42.87	0
January 1929 .. ..	81.06	62.84	65.05	78.22	46.64	0.98
February 1929 .. ..	84.87	63.85	66.97	82.35	39.75	0.51
March 1929 .. ..	95.55	72.68	75.06	92.28	41.87	2.74
April 1929 .. ..	97.95	77.82	80.01	94.16	54.06	1.63
May 1929 .. ..	99.20	81.35	83.98	95.62	59.48	1.52
June 1929 .. ..	95.16	78.65	79.68	87.08	69.90	5.47

## APPENDIX II.

*Monthly record of larvæ and breeding places and percentage.*

Months.	Number of suspected breeding places examined.	Number of breeding places with <i>A. stephensi</i> larvæ.	Number of <i>A. stephensi</i> larvæ.	Percentage of total <i>A. stephensi</i> larvæ during the year.	Percentage of total <i>A. stephensi</i> breeding places during the year.
July 1928 .. ..	508	201	6,617	24.1	17.8
August 1928 .. ..	492	178	4,751	17.3	15.8
September 1928 .. ..	435	105	3,343	12.2	9.3
October 1928 .. ..	256	93	2,351	8.6	8.2
November 1928 .. ..	340	76	1,158	4.2	6.7
December 1928 .. ..	310	56	972	3.5	4.9
January 1929 .. ..	324	69	1,178	4.3	6.1
February 1929 .. ..	276	50	1,003	3.6	4.4
March 1929 .. ..	273	78	2,127	7.7	6.9
April 1929 .. ..	275	71	1,305	4.7	6.3
May 1929 .. ..	294	61	980	3.6	5.4
June 1929 .. ..	336	93	1,713	6.2	8.2
TOTAL. .. ..	4,119	1,131	27,498	100	100











relied upon as the normal values. The months of January, May, July, and October respectively may be taken to be the most typical months of the cold weather, the hot weather, the monsoon season, and the dry period after the rains.

The writer's grateful thanks are due to Lieut.-Colonel R. Knowles, I.M.S., Professor of Protozoology, Calcutta School of Tropical Medicine, for suggestions and encouragement.

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## SOME NOTES ON THE UNION OF EPIPHYSES IN INDIAN GIRLS.

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In the course of routine radiological work at the Medical College Hospitals, Calcutta, during the past five years, I had often been struck by the differences in ossification times in India as compared with European subjects. As the

matter was of considerable importance from the medico-legal standpoint in determining whether or no a girl was a minor, I was approached by Major Mallaya, I.M.S., Police Surgeon, Calcutta, to make an investigation of the appearances seen in a large number of girls between the ages of eleven and nineteen. My difficulty hitherto, in such examinations, had been to get a really reliable statement of age from the parents. This was solved by the kind co-operation of certain schools and orphanages where the ages of the children were known and accurate records thereof had been kept.

The present work is a preliminary step in a more complete investigation embracing both the times of appearance of ossific centres and their union, in both sexes. This latter investigation must necessarily take some time, but is being done as far as possible.

### METHOD OF EXAMINATION.

All the girls had their ages certified by their schools or orphanages—so these may be taken as fairly correct. Owing to limitation of films to be used for the investigation, the radiography was limited to the hand, included the wrist and lower ends of the radius and ulna, and the elbow joints. In the latter case films were made of both aspects, anterior and lateral.

It was difficult in many cases to say bluntly whether a centre had joined or no. This has been got over by the following method. Union has been assumed to be complete when the epiphyseal space has been completely filled in, and the bone in epiphyses and diaphyses is of equal density. The linear epiphyseal scar which persists for some time after union has been disregarded where there are other signs of complete union. Other stages in union have been signified by abbreviations, viz.—

- O No union.
- C+ Commencing union. In these cases the epiphyseal space is present, but is beginning to cloud over. In many cases, fine striæ of bone are seen connecting epiphysis and diaphysis.
- JC+ An earlier stage in the same process.
- N+ Where this process is nearly complete but the epiphyseal line (apart from the scar) can still be distinguished.
- J+ Union just complete.

### THE HAND AND WRIST.

A. Metacarpals and Phalanges.—It was found that in the majority of cases fusion had taken place between the ages of fourteen and fifteen, and never later than sixteen. R. S. Pater-son(1) in a recent paper in *The Journal of Anatomy* states that the age in European girls examined at the Manchester Royal Infirmary was found to be seventeen. Most of the other authorities, including Cunningham(2), Gray(3), and Frazer(4), give a later date, varying between nineteen and twenty-one.

*B. Carpal Bones.*—These were found to be well developed in all the cases examined.

*C. Lower ends of the Radius and Ulna.*—The lower end of the radius was found in a great majority of cases to unite earlier than the corresponding end of the ulna, the difference varying from three months to more than a year in some cases. The figures found were fourteen to fifteen in the cases of the radius, and round about sixteen in the case of the ulna.

The following are the figures given by various authorities.

		Age of Union.	
Author.		L. E. Radius	L. E. Ulna.
Gray(3)	..	18—19	20
Morris(5)	..	20	20
Scudder(6)	..	19—20	—
Poland(7)	..	19—23	18—20
Cohn(8)	..	20—21	20—21
Cunningham(2)	..	21	21
Frazer(4)	..	22	20
Paterson(1)	..	19	19

It will be seen that the figures found in Indian girls are on the whole four years and even more, earlier than those found by the most recent observations of Paterson. It is interesting to note the very definitely earlier union in the case of the lower epiphysis of the radius.

#### LOWER END OF THE HUMERUS.

The centres for the capitellum and trochlea were found to join with the shaft of the humerus between the ages of eleven and fourteen. The great majority at the latter age showed complete fusion.

The epiphyses for the two condyles of the humerus were found as a rule to join the shaft between the ages of thirteen and fourteen. The appearance of the epiphyseal centre for the external condyle, which is given as fourteen years by most European authorities, was found to be much earlier in Indian subjects. It was found in many cases outside this series at ages between ten and eleven. In addition R. S. Paterson found that in 30 per cent. of cases the external condyle ossified as an extension of the nucleus of the capitellum. This was seen in the present series, but the number of girls examined at the earlier ages was not sufficient to confirm the figures given. I append the figures for the times of fusion of these epiphyses as given by various authorities.

Author.		Age of Union.
Cunningham	..	16—17
Frazer	..	17
Spalteholz(9)	..	17
Morris	..	17
Quain(10)	..	16—17
Buchanan(11)	..	17
Roberts and Kelly	..	20—22
Ashurst(12)	..	15
Paterson	..	14 to 15 in the case of females and 18 to 21 in the case of males.

The figures given by Paterson are significant. He has been the first to systematically divide the figures according to sex, and in his paper already referred to shows that there is a considerable difference in the times of union of the two sexes, which is after all to be expected from general considerations.

#### THE HEAD OF THE RADIUS AND THE OLECRANON.

The figures here were the same as in the case of the centres at the lower end of the humerus, i.e., union was found to take place between the ages of thirteen and fourteen. Paterson gives the figures as between fourteen and fifteen, or a year later.

#### CONCLUSIONS AND SUMMARY.

The union of ossific centres as found above, takes place considerably earlier in Indian as compared with European girls—the difference in time varying from one to four years according to the centre concerned. Until more work has been done on the subject, all statements on the age of minor girls, based on radiological findings, must be treated with reserve, particularly so when these findings are interpreted in the light of the figures published in European and American text books.

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#### THE PLACE OF NON-SPECIFIC PROTEIN THERAPY IN GYNÆCOLOGY.\*

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The efficacy of protein therapy has been well recognized for many years, and many of you

\* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad, January 1930.







will recall that in its early days this method was used for various forms of arthritis, where stimulatory reaction was needed for the relief of pain or increase of movement.

It will be our object to demonstrate that protein therapy has an important place in the treatment of certain gynaecological conditions, and to present to you certain facts which demonstrate that its use is of great value to the surgeon from an operative and prognostic point of view.

Professor Hofbauer of Johns Hopkins was the first to show that in addition to the defensive mechanism of Metchnikoff, the genito-urinary tract of the female is endowed with special cells in and around the cervix and parametrium, which have a special guardian function against sepsis. These guardian cells he called monocytes and clasmatoocytes, and he discovered that not only were they constant and peculiar to the parametrium, but that they multiplied from the moment of conception.

They are to be found in the greatest numbers at the base of the broad ligaments and in the meshes of the cardinal ligaments, having the function and capacity of devouring and destroying pathogenic organisms which may pass

mother as a result of pregnancy. The exact protein we do not know, but if from a prophylactic point of view we wish to raise the resistance of a pregnant patient, there can be no doubt that this can be done by the injection of a non-specific protein such as milk, and this procedure has been adopted in many cases with success before delivery, where from the nature of the labour, and its treatment, sepsis would have followed, the function of the injection having been to raise the number of clasmatoocytes and monocytes.

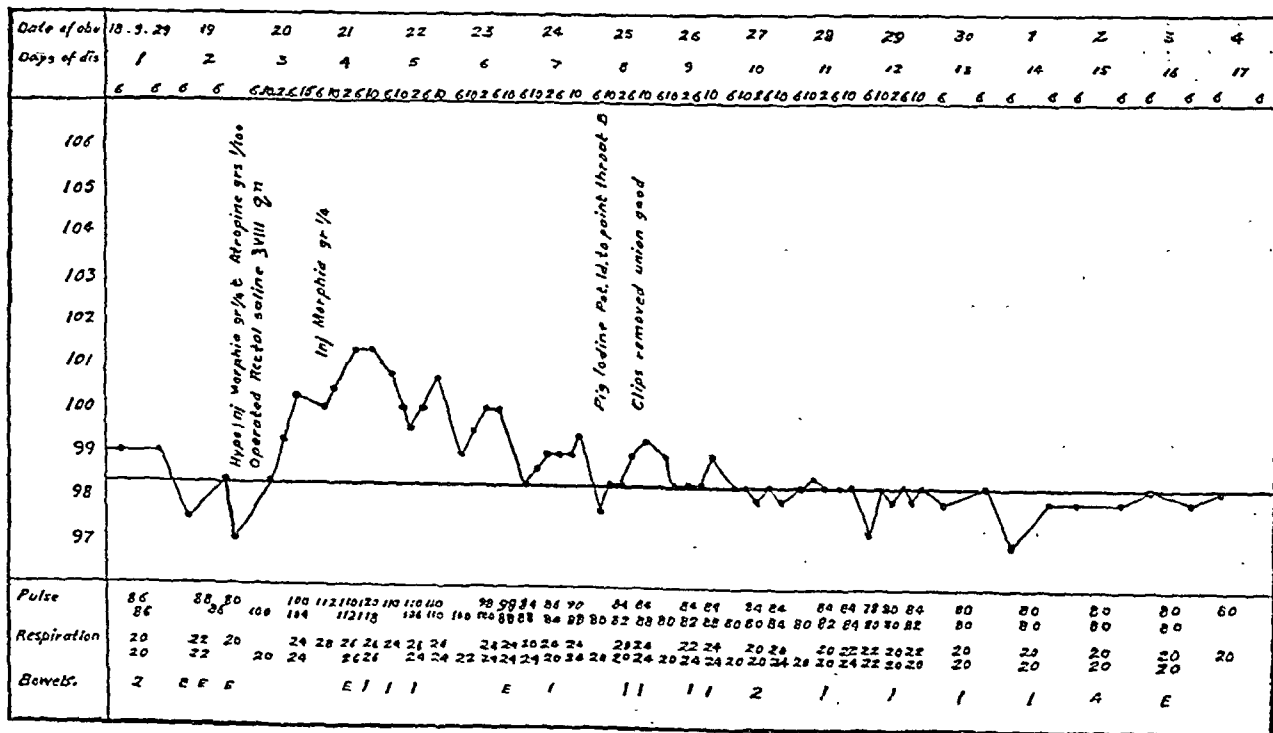
It is on this analogy, the result of actual practice, that many authorities consider a 5 or 10 c.c. injection of milk is as useful as a similar injection of prophylactic anti-streptococcal serum.

Now, if Nature has provided such guardian cells in the pelvis of a woman which multiply to the stimulus of a protein, it is right and reasonable for us to copy Nature when we may in those gynaecological conditions where the resistance and reaction to inflammation is defective or diminished.

It is on this principle in the main that the gynaecologist uses non-specific protein therapy, for the injection of a foreign protein not only increases the number of phagocytes in the blood

Name... Mrs J.

CASE I.



through the cervix, and not only can they do this but also they cause a vast increase of fibroblasts which limit the progress of inflammation, giving rise to scar tissue.

These facts have been corroborated by many authorities, and it is generally conceded that the increase and multiplication of the guardian cells is due to a protein from the placenta, ovum, or

stream and increases the number of active antibodies, but augments the function of the hæmopoietic organs.

Protein therapy is useful in the following conditions for which operation is either not feasible or not imperative:—

1. The fixed, tender and enlarged displaced uterus.

2. Tender and enlarged tubes and ovaries, accompanied by low fever.

3. Thickened and tender utero-sacral ligaments, with sacrahe.

4. Tenderness and thickening at the base of the bladder.

5. Parametrial exudates.

All these conditions are frequently met with by the general practitioner in India far from expert surgical opinion. At the moment such abominations and anachronisms as douches and plugs are the end-all and be-all of the average practitioner, a procedure which lasts for months and rarely does any good. *Ichabod!*

There is a type of case frequently seen in India in which the injection of a protein is of peculiar importance; we refer to those cases of pus tubes or tubo-ovarian masses which are found in all grades of society. These patients suffer for years and because pus is known, or thought, to be present, operation is considered dangerous. Nothing of the sort: 75 per cent. of those cases are originally gonococcal in whom the pus is sterile, and if doubt exists as to operability, great assistance can be gained from a few protein injections, for it will be found that in the majority of cases, there is no leucocytosis before the injection, and very little afterwards, whereas if the inflammatory mass be of streptococcal origin, there is marked leucocytosis before and after the injections and a very considerable febrile reaction as well.

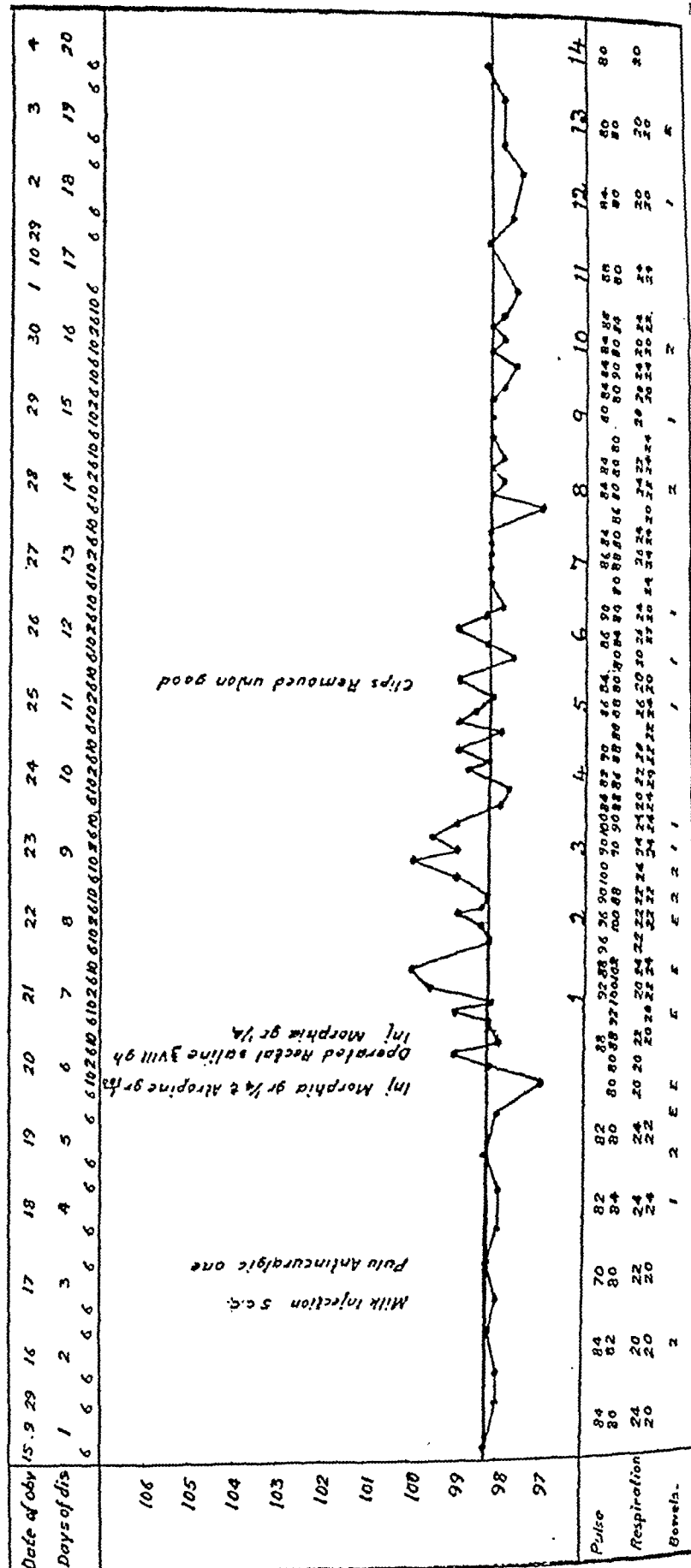
For instance, let me refer to these two case sheets and temperature charts of Anglo-Indian patients seen and operated upon in September 1929 (Cases 1 and 2). Both of them were cases of pus tubes of long standing, who had had the usual douche and plug business for years. Both suffered from exacerbations of fever and both when seen had normal temperatures and almost normal white blood counts, both were given 10 c.c. of milk intragluteally and as you will see neither had any reaction or rise in the white count. Both were operated on on the same day, and in both cases stinking pus spirted over the pelvic area of operation.

The pus sacs were removed together with the uterus, and the abdominal incision was completely closed, without drainage. You will see from the temperature charts that both healed by first intention, and without fever or complications. It was the milk injections that gave us the necessary clue from the point of view of treatment and prognosis. Surely this procedure is worthy of notice and an advance in operative gynaecology.

During the last two years we have had scores of similar cases where the prognosis and operative treatment were made easy by this procedure; moreover it is an interesting fact to record that the recovery of these patients is without storm or stress, and that it is just as useful in cases of *B. coli* and staphylococcal pyosalpinx as in the more usual gonococcal type.

# CASE 2.

Name... Mc C.



If pus tubes have been diagnosed, it is our routine to give three or four injections before operating, for thereby the resistance of the patient is raised and the necessity of vaginal drainage negatived.

The out-patient departments of women's hospitals throughout India are crowded with patients suffering from such conditions as we have enumerated above, but owing to the stress upon beds it is not possible to admit all such patients. We particularly refer to such cases as the boggy, fixed, retroverted uterus after labour or abortion, or the case of constant pain with discharge due to cellular infiltration of the base of the broad ligaments or of the utero-sacral ligaments. Until recently these cases had been treated with the time-honoured and time-abused douche and plug, but our experience with milk injections in the out-patient department has shown that this is a treatment far better and more expeditious.

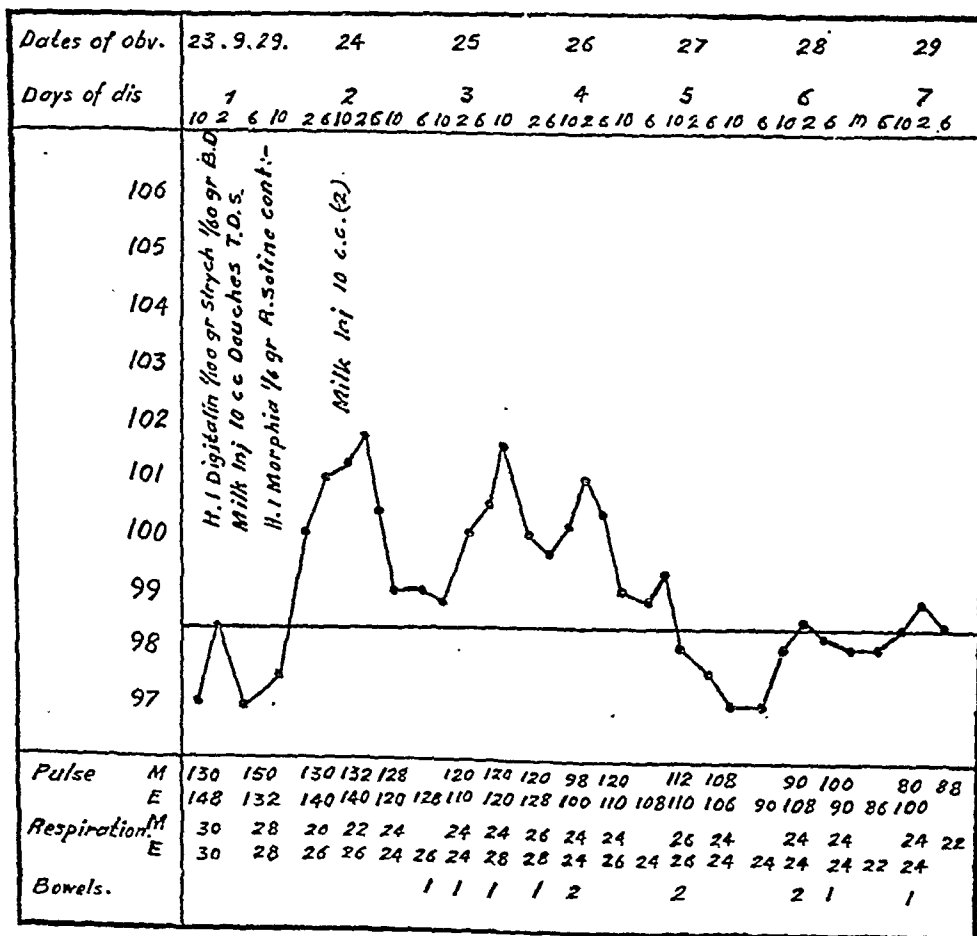
Table showing the nature of cases where milk injection was given and the results thereof:--

	Relieved.	Number cured.	Operation required.	Total.
Tubo-ovarian mass.	13	18	5	36
Retroverted fixed uterus.	4	3	1	8
Trigonitis ..	2	..	..	2
Parametritis ..	6	13	1	20
Thickening of utero - sacral ligaments.	6	4	..	10

The criterion of results has been achieved by (a) voluntary statements of the patient,

### Case 3.

Name—Raju Bala. Caste Hindu. Age 17.



The following table will show you the type and number of cases treated;—

(b) bimanual examination. If four to six injections of milk or Aolan have been given it is

extremely rare to find other than great improvement; for instance in August 1929 a Bengali patient, suffering intensely from pain in the left thigh, was admitted to the wards of Sir Frank Connor. It was found that she had a diffuse left-sided parametrial exudate extending almost to the left kidney. This condition occurred after a septic miscarriage; she was sent for opinion to the Eden Hospital and six injections at four days' interval were given. She was seen again on September 26th, when the greater part of the parametrial phlegmon was found to have dissolved and the patient herself stated that all her pain, which had been excruciating, had gone and she was now able to walk freely.

Another type of case frequently seen in upper and middle class practice is the old chronic salpingitis, subsequent to gonorrhœa or abortion. These cases, as you are aware, are frequently a source of invalidism, with menorrhagia, leucorrhœa and backache with or without attacks of low fever. Such cases treated up to date with detoxicated vaccines, diathermy or douches and plugs, give disappointing results. If operation is refused, excellent and often lasting cure can be obtained by non-specific protein treatment. It has been said that the proof of the pudding is in the eating, therefore we have no hesitation in recommending this treatment to practitioners in India who see these cases.

Finally, we wish to advise this line of treatment in cases of acute puerperal sepsis, for it would seem to be of greater value than anti-streptococcal serum. For instance, in September 1929 a patient was admitted 24 hours in labour with the arm prolapsed, smelling abominably. She had come 100 miles by train and the uterus was in tonic contraction. Evisceration and decapitation were performed and afterwards 10 c.c. of milk was injected into the buttock and repeated on the second day. Despite the threatened or expected acute puerperal septicaemia, her temperature, beyond the subsequent reaction of the injections, gave no anxiety, and her recovery was uneventful (Case 3).

One must suppose therefore that the protein stimulates the necessary activity of the cells in the cervix and broad ligament which combat infection.

For years we have been urging the adoption by the women's hospitals of India, of the low Cæsarean method of De Lee. India is the country *par excellence* in which this operation should be known and practised, for as you are aware, owing to absence, neglect or ignorance of the principles of ante-natal care, the majority of difficult labour cases arrive in hospital or are seen by the private doctor when the membranes have ruptured, and the head is high up and mobile above the brim of the pelvis.

One of the great advantages of the De Lee operation is that it can be done in labour and when the case is septic and the membranes have ruptured, provided the baby is alive. We have

done scores of these operations, and the results are astounding, for whereas a few years ago both mother and child would have been martyrs to ignorance, to-day both are saved.

Why does the mother live in these septic cases, despite opening the abdomen? The reason is that if the operation is properly performed, the incision is in the uterus under the peritoneum, and at the level of the bases of the broad ligaments, which are crammed with guardian cells which deal with any septic spill from the uterus and its incision, when once the peritoneum is efficiently sutured over the area of operation, a drainage tube in such cases being put suprapubically into the utero-vesical pouch. Let us record such a case.

*Case.*—In August 1929 Mrs. F. was sent into hospital in labour 48 hours; temperature 102°F., pulse 100, the head above the brim and a large child, R. O. P. On opening the lower uterine segment faecal stinking liquor amnii gushed out. A ten and a half pound baby was delivered, which lived and thrived. The spill from the uterus was carefully mopped up, and a suprapubic drain inserted after closing the transverse uterine incision.

The mother recovered completely after a period of fever due to *B. coli* infection. A few years back, when eversion of the uterus before incision was in vogue, this patient would have died of peritonitis. There must be in India every year thousands of very similar cases, where the child is sacrificed to delay or craniotomy, and the mother to rupture of the uterus or the old-fashioned classical incision. Most earnestly we ask the obstetricians of India to consider and do the low Cæsarean section in such cases, rather than perhaps sacrifice both mother and child on the altar of ignorance and tradition. For the processes of Nature are there to help us if we will but use them.

*Technique of Protein Therapy used in the Eden Hospital:*—

(1) Boil four ounces of fresh cow's milk for 20 minutes, and set aside to cool. Using a sterile Record glass syringe the needle is then passed down to the lower one-third of the milk so as to draw up 5 to 10 c.c. of fat-free fluid. This is injected at once into the buttock muscle on a line two inches from and at right angles to, the top of the intergluteal fold. The site of injection is then well massaged and the patient is told to expect a bout of fever and reaction in about 4 hours, which will last 24 hours. The greater the reaction, the better the result.

(2) If cow's milk is not used there is on the market a preparation called Aolan sold in 2.5 and 10 c.c. ampoules, which is handy and saves doubt and trouble. The first injection is 5 c.c. and every four days afterwards 7 or 10 c.c. is given for five or six injections in all. The greater the reaction the better the result.

### ON THE ADVISABILITY OF A ROUTINE WASSERMANN REACTION IN EVERY CASE OF DIABETES MELLITUS.\*

By H. STOTT, M.D., M.R.C.P.,  
LIEUT.-COLONEL, I.M.S.,

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At the Annual British Medical Association Meeting at Manchester in 1929, Professor A. S. Warthin, Director of the Pathological Laboratories in the University of Michigan gave a

\* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad, January, 1930.

summary of his findings of the lesions of latent syphilis in the various body organs, which have formed his intensive study for the last 23 years and of which he is justly so recognised an authority.

As regards the pancreas, Professor Warthin found that the lesions of latent syphilis were frequent, usually in the form of a mild interstitial pancreatitis not arising from the ducts. Moreover this interstitial pancreatitis was the most common form of pancreatic disease found in diabetic post-mortem material.

To the naked eye, in severe cases the organ was small, and much firmer than normal, except where there was marked œdema of the interlobular stroma, when the organ was usually larger and softer. Professor Warthin therefore believes that this interstitial pancreatitis of acquired syphilis may be one cause of pancreatic insufficiency. He also found that syphilitic pancreatitis with the presence of spirochætes and with varying degrees of fibrosis is frequently of congenital origin, and that this fibrosis may cause pancreatic insufficiency early in life.

These interesting findings of Professor Warthin support the views which we in Lucknow in our diabetic investigations have held and taught for many years past. We believe that even in a fat diabetic of the alimentary type, the insulin producing power of whose pancreas is, in the majority of cases, worn out by prolonged overwork, the superadded factor of syphilitic pancreatitis not infrequently aids in the pancreatic insufficiency. Moreover we find that in our series of 100 cases of diabetes those under 25 years of age showed a definitely higher positive Wassermann rate of 50 per cent. as compared with a positive rate of 32 per cent. in those over 25 years of age, pointing to the fact that the pancreas is affected more often in heredo-syphilis than in the acquired disease, and hence to the fact that syphilis is of special ætiological importance in the more serious type of diabetes of children and of adolescents. Syphilitic brain lesions too may lead to glycosuria—in the same way as any other brain tumour or other brain lesions—i.e., by irritating the region of the floor of the fourth ventricle.

Further, clinically, diabetics under our treatment with a positive Wassermann reaction have improved more rapidly and to a greater extent when placed on anti-syphilitic remedies, than when they were treated by diet and by internal remedies alone. In one case indeed the glycosuria entirely cleared up permanently with anti-syphilitic treatment alone, unaccompanied by any dietetic restriction. The possible danger of giving salvarsan to severe diabetics will be remembered, for one case of syphilis with serious diabetes went into coma after 0.35 gram salvarsan.

The pathological, serological and clinical evidence therefore all point to the importance of a

routine Wassermann test in every case of diabetes. For if this reaction be found positive, the patient will undoubtedly benefit materially if the syphilitic factor, which must unfavourably affect his pancreatic sufficiency, be removed.

## DIABETES MELLITUS IN CHILDREN.

By J. P. BOSE, M.B. (Cal.), F.C.S. (Lond.),  
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Medicine and Hygiene, Calcutta.*

*Introduction.*—There is no doubt that diabetes is much less common in children than in adults, specially in this country, and this is my excuse for publishing this short note on the following case of diabetes in a girl 12 years old. To save space, I have curtailed my notes and have only given a few salient features in the case.

*Incidence.*—An analysis of 1,025 cases of diabetes at Johns Hopkins hospital showed that only 8 cases among them were children between 1 to 10 years of age (0.78 per cent.), and 68 were of the age from 11 and 20 years (6.6 per cent.). In 1910, Von Noorden recorded only 2.8 per cent. of cases in children among his total of 3,000 cases, and Joslin, in his series of 2,440 cases of true diabetes, found that only 5.7 per cent. among them were children.

*Age of onset.*—Osler has recorded cases of diabetes under one year old. The youngest diabetic child in the Joslin series is a baby of 8 months old. Ashby (*Lancet*, 1923, i, 22) described the case of a five-months-old diabetic baby with gangrene of the toes. Major and Curran (*Journ. Amer. Med. Assoc.*, 1925, 84, 674) reported a case with diabetic cataract in a baby 11 months old.

In India, the late Rai Bahadur Dr. U. N. Sen reported a case of diabetes aged 6 years; there was a definite history of diabetes in the family and the child suffered from congenital syphilis as well. The youngest case in my series was an acute case of diabetes in an Anglo-Indian boy of 8.

*Etiology.*—Very little is known about the etiology of diabetes in children. According to many observers, heredity is regarded as an important factor in some cases.

*Prognosis.*—Is always grave, though there has been a much brighter outlook since insulin has been discovered, which has helped much in making the life of these children comfortable and in prolonging life by regular or periodical routine treatment by judicious adjustment of diet and insulin.

*Symptoms, complications and treatment.*—These are more or less the same as in the adult cases, except that in prescribing a diet for these children, one has carefully to calculate the caloric requirements of the patient according to his age, remembering that the protein-ration for a child per kilo. of his body-weight should be greater than that of an adult. It should also be borne in mind that children as a rule cannot take the



same proportion of fat per kilo. of body-weight as an adult, and that they are more liable to develop acidosis on a diet in which the proportion of fat is high.



Fig. 1.

Fig. 2.

#### CASE.

*Kumudini*, Bengali Hindu female, age 12 years, admitted into the Carmichael Hospital for Tropical Diseases on 23rd June 1929.

*Past history.*—She is reported to have suffered from some kind of urinary trouble when one year old, the exact nature of which could not be ascertained; no illness since.

*Family history.*—Clear; comes from a lower middle class; married about 1 year ago.

*History of the present illness.*—The patient had always enjoyed good health till she was 11 years and 2 months old (i.e., until 2 months after her marriage). From that time, she began to lose weight suddenly and rapidly, and extreme thirst, polyuria and a burning sensation over the whole body appeared within a very short time.

*Condition on admission.*—(Fig. 1). Very emaciated (almost skin and bone), extremely weak, could not walk, became breathless on the slightest exertion. She complained of a severe burning sensation over the whole body and an insatiable thirst.

*Physical examination.*—The patient was very undeveloped. The skin was dry and harsh, the tongue dry and raw, the teeth and gums healthy, no enlargement of glands, thyroid not palpable.

Heart sounds normal, lungs clear. No abnormality could be detected on abdominal palpation. No septic foci anywhere could be elicited. Her weight was 44 lbs. (20 kilos).

#### Laboratory examinations.

##### Urine.

Sugar	..	..	8 per cent.
Acetone	..	..	+++
Diacetic acid	..	..	++

##### Blood.

Blood-sugar	..	..	0.350 per cent.
Examination for microfilaria			Negative.
Agglutination against Typhoid,			
Para A, Para B, Shiga,			
Flexner	..	..	Negative.
Aldehyde test	..	..	Negative.
Blood for malaria parasites	..	..	Negative.

##### Stool.

Culture	..	..	No non-lactose fermenters.
Protozoa	..	..	Blastocystis +.

*Treatment and progress of the case.*—On account of her very low condition, she was put on a fairly liberal diet, allowing 45 to 50 calories per kilo. of her body-weight. The protein-ration given to her was 3 grammes per kilo. of her body-weight and she was given about 100 grammes of carbohydrates in various forms to start with, the fat-ration being kept fairly low. The diet was then carefully reduced gradually.

The blood-sugar fluctuated between 0.300 per cent. to 0.480 per cent. for some time and eventually came down to 0.210 per cent. near about which level it kept for some time. The quantity of urine passed daily fluctuated a good deal, varying from 40 ozs. in some days to 150 ozs. in others. The maximum quantity of sugar passed was 235 grammes per day. She was put on insulin treatment, first one injection daily, later on twice, the maximum dose given during her stay in hospital being 44 units daily. Under insulin, all the distressing symptoms disappeared quickly, the patient felt quite comfortable and gained in flesh and weight as Fig. 2 will clearly show. The only undesirable symptom which could not be controlled by any method of treatment was her "beg, borrow, or steal" -way of getting all kinds of extra diets from various sources in spite of all precautions. When, at last, very stringent measures were taken and her questionable habits were put under restraint, she and her over-affectionate father got rather annoyed with the strict discipline observed in the hospital and the latter decided to take his ward away in spite of advice to the contrary; he however promised, as usual, to continue the insulin treatment and rigid dieting at home. She was discharged from hospital "improved."

## THE TECHNIQUE OF SPINAL ANALGESIA.

By Dr. J. G. MARTIN, M.D.

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American Mission Hospital, Taxila, Punjab.

SOME three years ago we began to employ spinal analgesia at Taxila Hospital. We had seen chloroform used in many hundreds of operations in various clinics in India, but were always more or less on edge while operating, lest the anæsthetist should give too much. Further, it has been repeatedly shown that a chloroform anæsthesia of any length causes actual

pathological changes in the liver. Ether on the other hand, although practically fool-proof as far as the immediate anaesthesia is concerned, we have seen end in a pneumonia, and light up an acute tuberculous process in the lungs. Furthermore it is a dangerous anaesthesia to give in a stove-heated operating room, which is the usual source of heat in North India.

We bought the Labat outfit of syringes and needles and used the technique as described in Labat's work on *Regional Anaesthesia*. At first in order to prevent the fall of blood-pressure we used intramuscularly an ampoule of an ether-camphor mixture marketed by Parke, Davis and Co.; when ephedrine came on the market we began to use a  $\frac{1}{2}$  gr. of this intramuscularly. Shortly after this Sise, in the *Surgical Clinics of North America*, Vol. 8, p. 195, called attention to the fact that if the neocaine or novocain was given intraspinally before the pressor effects of ephedrine had taken place the ephedrine failed to maintain the blood-pressure. For this reason we began to give the ephedrine just after we had drawn the 10 to 15 c.c. of spinal fluid as described in the Labat technic. In a minute or so after the ephedrine had been given, or by the time the neocaine crystals had been dissolved in some 3 c.c. of the withdrawn spinal fluid, the pressor effects of the ephedrine had taken place. This could readily be seen by the increased rate of flow of the spinal fluid upon withdrawing the stylet from the needle with which the lumbar puncture had been done, and which was in position awaiting injection of neocaine dissolved in spinal fluid.

At first we took the blood-pressure, and followed Labat's contra-indication of not using spinal anaesthesia when the blood-pressure was below 100. But the effects of ephedrine so pleased us, that we no longer used the blood-pressure as an indication for or against spinal anaesthesia, but this anaesthesia became our routine for all operations below the diaphragm. In all we have given some 50 spinal anaesthetics, and in not one of them have we had any reason to feel anxious. In a few cases early in our experience the patients became nauseated. This was quickly relieved by dropping down the head of the operating table. Since we have learned the proper use of the ephedrine, I do not recall a single case where there has been any nausea.

Following the reading of an article in the *Journal of Surgery, Gynecology and Obstetrics* for November 1929 by Koster and Kasman on spinal anaesthesia for the head, neck and thorax, we have operated upon a man of 60 years with an epithelioma of the eye, in which it was necessary to enucleate the eye. Our technique was as follows. The man was given no previous narcotic or sedative. He was seated on the operating table in the usual crouched-over position for lumbar puncture. One-half grain of ephedrine was given intramuscularly into the deltoid. With a fine needle a few c.c. of  $\frac{1}{2}$  per cent,

novocain were injected, first intradermally and then deep in the muscle and fascia between the 3rd and 4th lumbar vertebrae. Through this area a lumbar puncture needle was passed carefully so as not to pass beyond the posterior compartment of the subarachnoid space. For Koster and Kasman have called attention to the introduction of the anaesthetic fluid into the anterior compartment as a probable cause of the sudden fall of blood-pressure, since the anterior roots lie in this compartment and these contain the vaso-constrictor fibres. Eight c.c. of spinal fluid is drawn off in a syringe attached to the lumbar puncture needle. In this was dissolved 0.24 gm. of Neocaine crystals supplied in sterilized tubes by the Anglo-French Co. of 0.10 gm. and 0.12 gm. This 0.24 gm. of Neocaine dissolved in 8 c.c. of spinal fluid was injected into the subarachnoid space through the needle already in position. This needle was withdrawn and the man was placed in a Trendelenburg position of about 15 degrees.\* After about five minutes, since the man insisted he was still quite conscious, he was given a few whiffs of ether by placing in his mouth a rubber tube attached to an ether vaporizer used in tonsilectomy. As soon as the tumor had been enucleated the rubber tube was removed and the necessary incisions of his eye-lids made in order to remove the tumor, after enucleation these were sutured, while the patient carried on a conversation with the operator. During this entire procedure the patient's radial pulse was regular and quite palpable. There was no nausea or vomiting. After the operation, the patient was returned to the ward and placed in bed with the foot of the bed slightly elevated. Four hours later the doctor passed through the ward and the patient was sleeping soundly, having as yet received no narcotic or sedative. That evening the patient sat up and enjoyed a good meal.

Koster and Kasman, by showing that the cocaine group of drugs have a selective affinity for sensory nerve tissue and that the respiratory centre appears to have a high immunity, have placed the technique of spinal analgesia on a new basis. Instead of the warning to elevate the head in order that the anaesthetic fluid might not reach the respiratory centre, one must keep the head down, so that the respiratory centre may not suffer from anaemia—the probable cause of death due to spinal anaesthesia.

Koster and Kasman recommend the following dosage. For ordinary anaesthesia up to the diaphragm for a period of 50 minutes 0.10 gm. Neocaine in 4 c.c. of spinal fluid. For thorax and head anaesthesia in children from 7 and 8 years upwards and in adults 0.25 gm. Neocaine in 8 c.c. of spinal fluid. The same in anaesthesia in children from 8 to 5 years, 0.20 to 0.15 gm. Neocaine in 6 c.c. of spinal fluid. Between

\* It is understood that this lumbar puncture, etc, has been carried out aseptically, not antiseptically.

the ages of 2 and 5 years, 0.15 to 0.10 gm. Neocaine in 4 c.c. of spinal fluid; and below the age of 2 years. 0.05 gm. to 0.10 gm. of Neocaine in 3 c.c. of spinal fluid.

Here is an anæsthesia that is cheap, safe, causes no pathological changes in tissue, and is the best nerve-block known. It is ideal for the surgeon in that he does not have the worry of an incompetent anæsthetist, he has a quiet patient, who is breathing quietly, with a normal or decreased blood-pressure (which means less loss of blood than under such an anæsthesia as ether) and with a perfectly relaxed voluntary musculature.

### HELMINTHIC INFECTIONS IN SHILLONG.\*

By A. N. SHARMA, M.B., D.P.H., D.T.M. & H.,  
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**Introduction.**—Shortly after his arrival in Shillong, the author noticed quite a number of men reporting sick every morning who appeared to him to be suffering from effects of helminthic infections, as most of them complained of general weakness, loss of appetite and disinclination to do any work, whilst others had definite symptoms of colitis and dysentery: a dose of castor oil or magnesia generally resulted in their passing a few round-worms.

Consequently a regular examination of the stools of all troops in the garrison was carried out during the months of September to December 1929. Samples of fresh stools of 503 civilians, consisting mostly of labourers and working classes, were also examined in order to compare the incidence of helminthiasis in the troops with the civilian population as well as to reveal any local foci of infection.

The survey failed in the latter respect.

**Note.**—Samples of dust from—

- (a) Streets around the regimental lines;
- (b) near the building operations; and
- (c) around the latrines were also collected and examined several times in—
  - (i) dry state, and
  - (ii) in saline—but were found to be negative for helminthic ova.

#### METHOD.

(1) The method followed was to mix up a small quantity of fæces on a slide with normal saline and to search the whole area under the cover slip first under a 1|3rd objective and later under the 1|6th.

(2) Failing to find any ova, another slide was prepared with Gram's iodine and searched.

(3) If negative again Lane's direct centrifugal flotation method was used—thus it is very probable that only a few helminthic infections were missed, if any.

The total number of stools examined were 1,728, consisting of:—

540	.. 1st Battalion.
685	.. 2nd Battalion.
503	.. Civilians

---

1,728

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Of these the total number of stools positive for helminthic infections were 1,046, i.e., 60.5 per cent.—thus most of the cases had more than one type of helminthic ova.

#### NOTE.

(1) It is to be noted that the percentages of infections were more in the 1st Battalion as compared to the 2nd on account of the fact of their having been stationed about a year and a half longer in Shillong—the 2nd Battalion having only arrived here in April 1929.

(2) *Ages.*—The ages of soldiers examined were between 18 and 40, that of the civilians being between 10 and 50.

#### GENERAL FINDINGS.

(1) A very large percentage of men were found to be suffering from *Ascaris* infection, thus out of a total of 1,728 stools examined 995 were found to contain *Ascaris* ova (see Table I). As a result of a mass treatment of one of the battalions a very large number of adult worms were passed.

(2) *Ankylostoma* is very prevalent, i.e., 22.9 per cent. of the total number examined. It is not surprising considering the system of latrines and the habits of the people as regards ablutions.

(3) *Trichuris trichiura* is quite common, i.e., 13.4 per cent. of the total number.

(4) *Enterobius vermicularis*; it was very surprising to find 47 cases of the ova of this nematode in adults, 2.7 is quite a large percentage.

(5) Eighty-nine samples of stools had *Strongyloides* larvæ in non-infective stage.

(6) The ova of *Fasciolopsis buski* were found in forty cases—this fluke is quite common here, i.e., 2.1 per cent.

(7) *Gastrodiscus hominis* was found in 56 cases; as a result of thymol treatment a large number of cases passed the worms.

(7) It is very interesting to note that four cases of *Heterodera radicola* and three of *Bertiella satyri* were found; only amongst the civilian group.

(9) One case of *Tania saginata* was found in a soldier who was serving on the North-West Frontier last year and arrived in Shillong a few months ago.

\* Being a paper read at the Medical and Veterinary Research Section of the 17th Indian Science Congress, Allahabad, January, 1930.

The following tables are attached:—

TABLE NO. I.

A list giving the number and percentages of various helminths in Shillong out of a total of 1,728 samples of stools examined.

TABLE NO. II.

The helminths found in 1st Battalion.

TABLE NO. III.

The helminths found in 2nd Battalion.

TABLE NO. IV.

The helminths found in stools of 503 of civilian population.

*Note.*—A graph is also attached for comparison of the above three groups—giving the number and percentage of each helminth.

TABLE NO. I.

*Numbers and percentages of various helminths in Shillong.*

	Percentage.
Total number of stools examined for ova of helminths ..	1,728
Total number containing helminths ..	1,046 60.5
Number containing <i>Ascaris</i> ..	995 57.5
Number containing <i>Ankylostomes</i> ..	397 22.9
Number containing <i>Trichuris trichiura</i> ..	243 13.4
Number containing <i>Enterobius vermicularis</i> ..	47 2.7
Number containing <i>Strongyloides larvæ</i> ..	89 5.1
Number containing <i>Gastrodiscus hominis</i> ..	56 3.2
Number containing <i>Fasciolopsis buski</i> ..	40 2.1

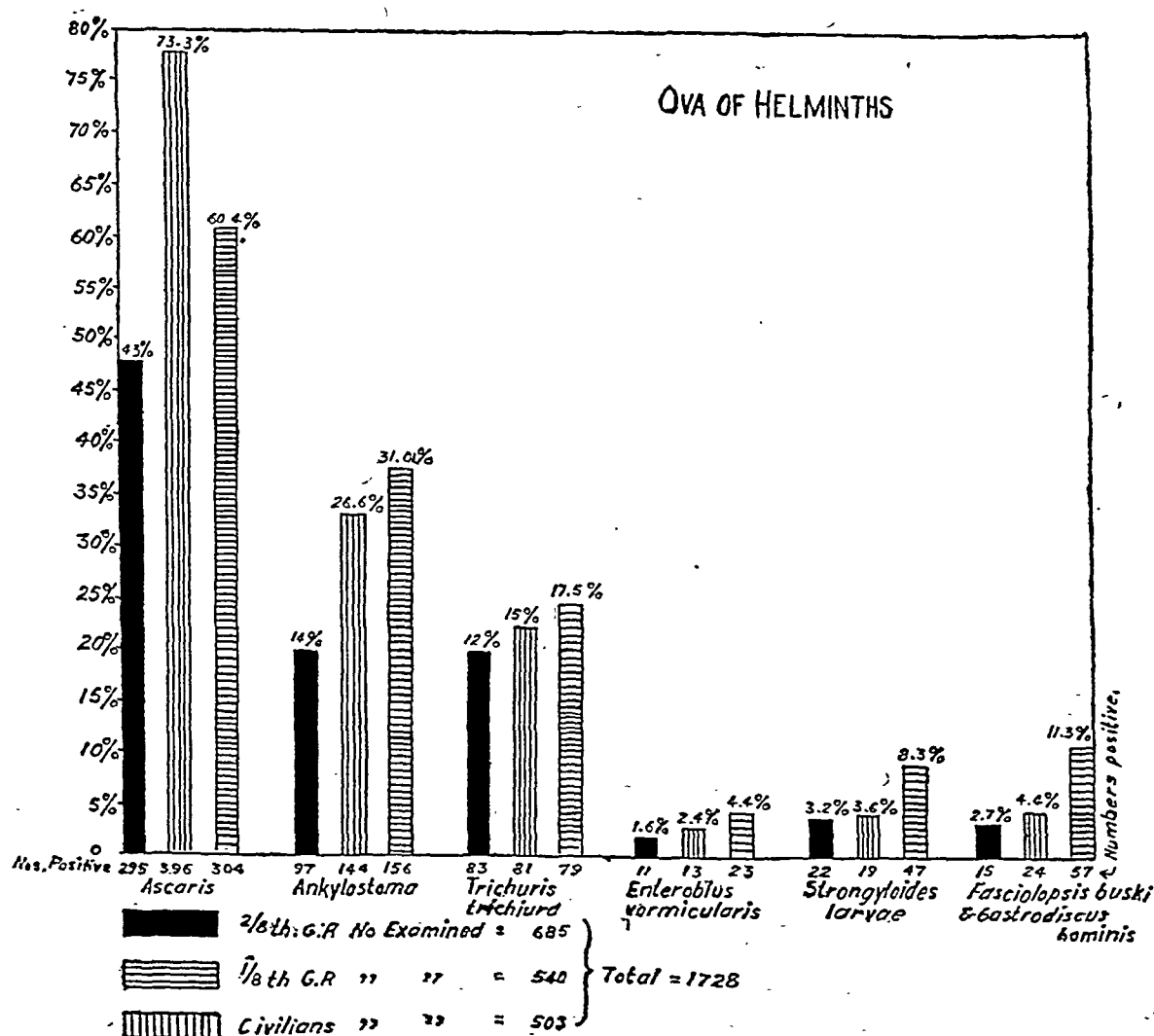


TABLE No. II.

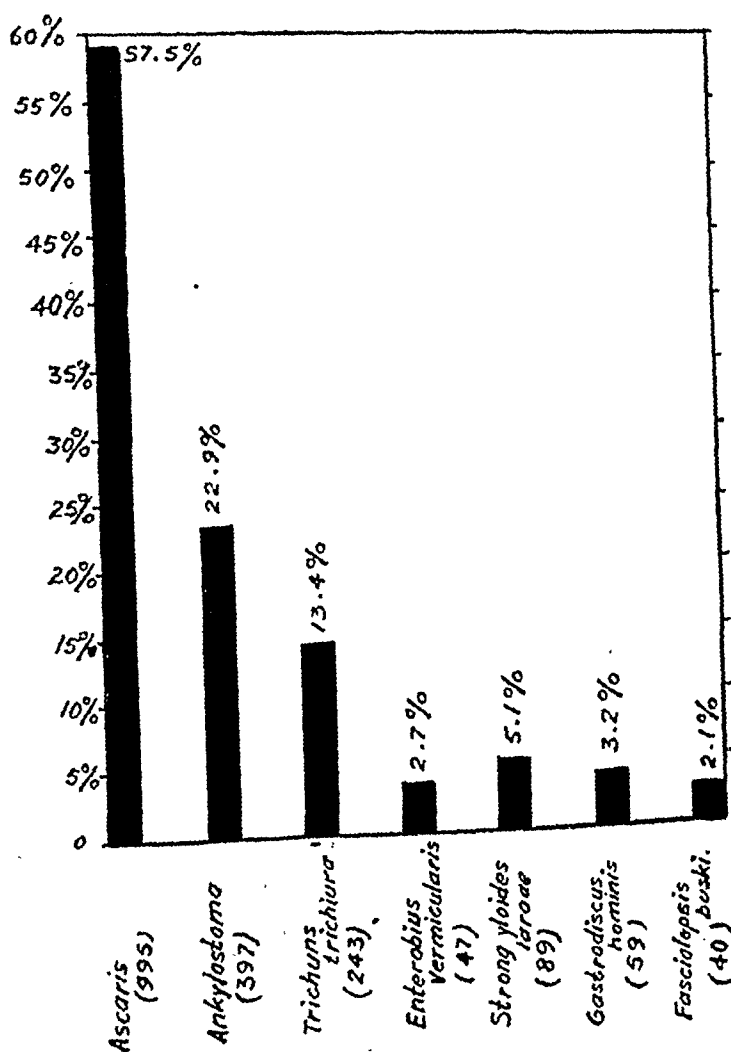
*Helminthic infections in 1st Battalion.*

		Percentage.
Total number of stools examined for ova of helminths ..	546	
Total number containing helminths .. ..	409	75.7
Number containing <i>Ascaris</i> .. ..	396	73.3
Number containing <i>Ankylostomes</i> .. ..	144	26.6
Number containing <i>Trichuris trichiura</i> .. ..	81	15.0
Number containing <i>Enterobius vermicularis</i> .. ..	13	2.4
Number containing <i>Strongyloides larvæ</i> .. ..	19	3.6
Number containing <i>Gastrodiscus hominis</i> .. ..	13	2.4
Number containing <i>Fasciolopsis buski</i> .. ..	11	2.0

TABLE No. III.

*Helminthic infections in 2nd Battalion.*

		Percentage.
Total number of stools examined for ova of helminths ..	685	
Total number containing helminths .. ..	311	45.4
Number containing <i>Ascaris</i> .. ..	295	43.0
Number containing <i>Ankylostomes</i> .. ..	97	14.0
Number containing <i>Trichuris trichiura</i> .. ..	83	12.0
Number containing <i>Enterobius vermicularis</i> .. ..	11	1.6
Number containing <i>Strongyloides larvæ</i> .. ..	22	3.2
Number containing <i>Gastrodiscus hominis</i> .. ..	6	0.8
Number containing <i>Fasciolopsis buski</i> .. ..	9	1.3



No. of stools examined = (1728)

Total no. of stools in which Helminths were found = (1046)

TABLE NO. IV.

*Helminthic infections in civilian population consisting mainly of labourers and working classes.*

	Percentage.	
Total number of stools examined for ova of helminths ..	503	
Total number containing helminths ..	326	64.8
Number containing <i>Ascaris</i> ..	304	60.4
Number containing <i>Ankylostomes</i> ..	156	31.01
Number containing <i>Trichuris trichiura</i> ..	79	17.5
Number containing <i>Enterobius vermicularis</i> ..	23	4.4
Number containing <i>Strongyloides</i> larvæ ..	47	8.3
Number containing <i>Gastrodocus hominis</i> ..	37	7.3
Number containing <i>Fasciolopsis buski</i> ..	20	3.9

## THE VALUE OF THE ANTIMONY TEST IN THE DIAGNOSIS OF KALA-AZAR.

## Part II.

## THE FINGER PRICK BLOOD TEST.

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and

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Research Assistant.

(From the Department of Pharmacology, Calcutta School of Tropical Medicine.)

**Introduction.**—From the time of the discovery of the antimony test for the diagnosis of kala-azar (1927) the great sensitiveness of the reaction was appreciated by its originators. They found that the reaction was obtained in fairly high dilutions of the serum and quite apparent and definite precipitation was obtained in dilutions of 1 in 10 to 1 in 20. Chopra, Gupta and Basu (1927) described a simple test for the diagnosis of kala-azar which could be performed with a drop of blood, obtained from a finger pricked with a needle, and diluted with a solution of potassium oxalate. Although the series of cases of both kala-azar and controls on which this test was tried were small, these workers came to the conclusion that the results obtained with this simple test ran practically parallel with those obtained with the serum test and that the reaction had great possibilities in giving a simple, rapid and economical test for the diagnosis of kala-azar.

Napier (1929) carried out a series of observations with the finger prick test in the Out-patient Department of the Calcutta School of Tropical Medicine and Hygiene but did not obtain satisfactory results. The present authors, therefore, very carefully went into the details of the test and carried out a large series of observations with different dilutions of the blood and the reagent, the diluted blood with corpuscles in suspension

and without. It is unnecessary to describe the details of this work here and we will confine ourselves to some of the salient facts which will help the practitioner to understand and perform this test. Throughout the whole of the research our object was to evolve a simple and rapid test for the diagnosis of this disease. We wished specially to avoid the puncture of the vein to obtain blood so that the test could be carried out by the bed-side or on a large scale in the kala-azar treatment dispensaries in an area where the disease is prevalent. We are very grateful to Dr. L. E. Napier, in-charge of the Kala-Azar Research, for his kindness in giving us access to his patients in the wards of the Carmichael Hospital for Tropical Diseases as well as the Out-patient Department. But for his help and co-operation it would not have been possible for us to carry out the present observations.

## TECHNIQUE.

The original technique of this test was published in the August number of the *Indian Medical Gazette*, 1927, and after subsequent observations we have made certain alterations in this technique which is now as follows:

A drop of blood from the pricked finger is received in a small test tube (3/8th inch internal diameter and 2 inches long is most convenient) containing  $\frac{1}{4}$  c.c. of a 2 per cent. solution of potassium oxalate. If a larger quantity of oxalate solution is used, a correspondingly larger quantity of blood from the finger will have to be taken. The drop can easily be received into the tube containing the oxalate solution by pressing its mouth against the finger with the drop of blood in the centre and inverting the tube. The oxalate solution thus takes up the drop of blood, which is then shaken to get a thorough admixture. The corpuscles are allowed to settle down and this usually takes about 10 minutes or a quarter of an hour. The supernatant fluid is taken by means of a capillary pipette and is transferred to a miniature test tube 4 to 5 mm. in diameter and 2 inches long. A 4 per cent. solution of urea-stibamine is then allowed to run slowly along the side of the tube as in case of the serum test. The heavy antimony solution rapidly permeates through the diluted blood serum and in case of kala-azar blood a coarse flocculent precipitate is seen appearing slowly in the whole column of the fluid. As has been already pointed out in the serum test dilution method, the flocculent character of the precipitate is the true criterion of positivity. A non-flocculent precipitate or haziness in the solution or even a granular precipitate should not be considered as giving a positive reaction. According to the physical character of the precipitate we class the results as follows:—

(1) *Positive reaction.*—Here the precipitation is very definite and its flocculent character is distinct and evident to the naked eye.

(2) *Doubtful reaction.*—In these cases there is usually some haziness after the addition of the



urea-stibamine solution or a granular looking precipitate may be formed, but there is no true flocculation. Sometimes it may be possible to decide this after examination with a magnifying lens but often it is not necessary.

(3) *Negative reaction.*—The fluid remains absolutely clear after the addition of urea-stibamine solution.

#### TIME FACTOR IN THE FINGER PRICK TEST.

In the series of cases done by Dr. Napier, referred to above, the test was performed in the Out-patient Department and the results were read by the senior author later on in his laboratory. Sometimes an hour or two elapsed before this was done and we were convinced at the time that this was not right and was probably one of the causes of discrepancy in the readings. We therefore decided to work out the time of appearance of the precipitate, its maximum development and any further change which might occur after the solution of urea-stibamine was added to the diluted blood several hours after the test was performed. For this purpose 50 cases of definitely diagnosed kala-azar with positive parasitic findings and 50 non-kala-azar controls were taken and in each case the tubes were carefully examined at regular intervals for 2 or 3 hours after the mixing of the fluids, the results being carefully recorded. The following table gives a summary of the results obtained:

TABLE I.

*Time of appearance of flocculent precipitate in 50 definite kala-azar cases in which diagnosis was made by finding L. D. bodies.*

Number of cases.	Time taken by the precipitate to become distinctly flocculent in character.
9	1 minute.
15	2 minutes.
12	3 minutes.
12	4 minutes.
2	5 minutes.
TOTAL 50 cases	

39 out of 50 cases in 2 to 4 minutes, in 9 cases in 1 minute, and 2 cases in 5 minutes. In no case did the precipitate take longer than 5 minutes to appear. After this period the precipitate remains in suspension for at least 10 to 20 minutes and then gradually settles down at the bottom of the miniature tube leaving a clean or hazy supernatant fluid. The best time for reading the test from these cases would be between 5 to 10 minutes after the test was performed.

TABLE II.

*Time of development of haziness or any kind of precipitate in 50 non-kala-azar control cases.*

Number of cases.	Time in which haziness or slight granular looking precipitate appeared.
0	10 minutes.
3	30 minutes.
8	40 minutes.
7	50 minutes.
32	No precipitate or haziness appeared within 50 minutes.
TOTAL 50 cases.	

A perusal of Table II gives the results of observations with 50 control cases. It will be seen that in no case did the flocculent precipitate appear within 10 minutes as in the case of kala-azar sera. In 18 cases out of 50 a haziness or some sort of precipitate appeared in the tube 30 to 50 minutes after the test was performed; 32 remained quite clear even after 2 hours. The readings taken after standing for 20 minutes would, therefore, be fallacious.

It would, therefore, be advisable to take readings within 10 minutes after mixing the fluid, never more than 15 minutes.

#### FINGER PRICK TEST IN KALA-AZAR CASES.

Table III gives the results obtained with the finger prick test in 124 definite cases of kala-azar in which the diagnosis was made by parasitic findings. The finger prick test, antimony test with diluted serum, and aldehyde test were studied in this series to determine their comparative value.

TABLE III.

	Total number of cases.			Percentage of cases.		
	Strongly positive and positive.	Doubtful.	Negative.	Strongly positive and positive.	Doubtful.	Negative.
Finger prick test .. ..	100	11	13	80.7 %	8.9 %	10.4 %
Antimony test. Diluted (1 in 10)	107	8	9	86.3 %	6.5 %	7.2 %
Aldehyde test .. ..	105	15	4	84.7 %	12.1 %	3.2 %

A perusal of Table I shows that well marked development of flocculent precipitate occurred in

A perusal of these results shows that the finger prick test was positive in 80.7 per cent. in this

series, as compared with 86.3 per cent. of the antimony test with diluted serum, and 84.7 per cent. with the aldehyde test. The doubtful and incorrect diagnosis in definitely kala-azar cases amount to 19.3 per cent., as compared with 15.5 per cent. with the aldehyde test, and 13.7 per cent. with the antimony test with diluted serum.

Table IV gives results of the test in 162 cases from the Out-patient Department of the Calcutta School of Tropical Medicine and Hygiene in which the diagnosis was made on the basis of the aldehyde test.

positive findings only in 9 cases, or 11.5 per cent., as compared with 6.4 per cent. in the antimony test diluted serum method, and 5.1 per cent. with the aldehyde test. The percentage of "positives" and "doubtfuls" with the finger prick test is 24.4, with the antimony test diluted serum 22.8, and with the aldehyde test 38.4. All these cases were from the Out-patient Department of the Medical College, Calcutta, and the readings of the aldehyde tests were taken by the clinical pathologists of that institution.

When the same test was applied in a non-

TABLE IV.

	Number of cases.			Percentage of cases.		
	Strongly positive and positive.	Doubtful.	Negative.	Strongly positive and positive.	Doubtful.	Negative.
Finger prick test .. ..	140	11	11	86.4 %	6.8 %	6.8 %
Antimony test. Diluted in serum (1 in 10) .. ..	152	8	2	93.8	5.0	1.2
Aldehyde test .. ..	162	0	0	100.0	0	0

A perusal of Table IV shows that the finger prick test is positive in 86.4 per cent. of these cases, as compared with 100 per cent. with the aldehyde test, and 93.8 per cent. with the antimony diluted serum test. The doubtful and negative reactions amount to 13.6 per cent. in case of the finger prick test, as compared with 6.2 per cent. in case of the antimony test with diluted serum. It would not be fair to compare it with the aldehyde test, as in this series this latter test was used as a basis of diagnosis and therefore was bound to give cent. per cent. positive. It will be seen that the finger prick test gives very fair results and should constitute a useful aid in diagnosis where it is not convenient to apply the other more accurate tests.

#### FINGER PRICK TEST IN NON-KALA-AZAR CASES.

In Table V are given the results of the finger prick test in 78 apparently non-kala-azar cases from a kala-azar endemic area.

It will be seen that the finger prick test gave

endemic area the results were even better. We are very grateful to Dr. P. V. Gharpure of the Department of Pathology, Grant Medical College, for doing a series of cases for us in the Bombay Presidency.

Table VI gives the results of the finger prick test in 266 cases.

TABLE VI.

Nature of cases.	Total number.	Positive in 1 in 10 and higher dilution.	Negative.
Enlarged spleen	135	2	133
Fevers ..	53	0	53
Malaria ..	64	0	64
Tuberculosis ..	14	0	14
	266	2	264

TABLE V.  
Non-kala-azar cases. Total 78.

	Number of cases.			Percentage of cases.		
	Strongly positive and positive.	Doubtful.	Negative.	Strongly positive and positive.	Doubtful.	Negative.
Finger prick test .. ..	9	10	59	11.5 %	12.8	75.6
Antimony test. Diluted (1 in 10) .. ..	5	12	61	6.4	15.4	78.2
Aldehyde test .. ..	4	26	47	5.1	33.3	61.6

It will be seen that only 2 cases in the enlarged spleen group gave the characteristically flocculent precipitate. Of these two, one was a suspected case of kala-azar with 18 months' history of fever with anæmia, hydraemia and leucopænia. The formol-gel test was also positive according to Dr. Gharpure's reading but neither a culture nor a spleen or liver puncture was possible. The other patient could not be followed up.

In a non-endemic kala-azar area, therefore, the percentage of negatives with the finger prick test among non-kala-azar cases was 99.3. We have already commented on similar findings in case of the antimony serum test in a previous paper, and the same remarks are applicable here.

#### DISCUSSION.

The extreme simplicity and ease with which the finger prick test can be performed is its chief asset. The difficulties and dangers of puncturing a vein and drawing blood in non-expert hands are well known. This test, although it is not so accurate as the aldehyde or antimony serum test, will be particularly useful to the medical man working in the endemic kala-azar areas where a large number of cases have to be dealt with and treated. He can form a correct diagnosis in 80 to 86 per cent. of patients as compared with 85 to 95 per cent. by the antimony test with diluted serum and aldehyde test.

#### SUMMARY AND CONCLUSIONS.

1. The revised technique of the finger prick blood test and the standards of positivity are described. The test is best done with the supernatant fluid after the blood corpuscles have completely settled down at the bottom of the tube. This usually takes 10 to 15 minutes.

2. For the correct interpretation of the test, the reading should be taken preferably from 5 to 10 minutes after the mixing of the solutions, certainly not more than 15 minutes. Readings taken later on are liable to error.

3. In 124 definite cases of kala-azar in which the diagnosis was made by parasitic findings, a positive reaction was obtained in 80.7 per cent. of cases, as compared with 86.3 per cent. with the antimony test with diluted serum, and 84.7 per cent. with the aldehyde test.

4. In 162 cases of kala-azar in which diagnosis was made on the basis of the aldehyde test, a positive test was obtained in 86.4 per cent., as compared with 93.8 per cent. with the antimony test with diluted serum.

5. In 78 non-kala-azar cases, the finger prick blood test gave positive findings in 11.5 per cent. of cases, as compared with 6.4 per cent. with the antimony test with diluted serum, and 5.1 per cent. with the aldehyde test in an endemic kala-azar area. The same test done in a non-endemic kala-azar area in 266 cases gave 99.3 per cent. of negatives.

6. The test is extremely simple, can be rapidly performed, and is a good rough test for the

diagnosis of kala-azar. It is a bed-side test in its true sense. The difficulties and dangers of vein puncture in inexperienced hands are avoided.

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## A Mirror of Hospital Practice.

### A CASE OF SPOTTED FEVER (ROCKY MOUNTAIN FEVER, TICK FEVER OR TYPHUS FEVER).

By S. C. DE, L.M.S.

Acting Medical Officer, Bengal-Nagpur Railway, Bilaspur.

Mr. S., aged 35, Anglo-Indian. Occupation—Guard. Bengal-Nagpur Railway, Bilaspur.



Previous history.—He had no serious illness, except double pneumonia while in Mesopotamia in 1918. He had kept in good health since. No specific history.



trace of albumin in the urine and a large number of the ova of *Ascaris lumbricoides* in the faeces.

I gave her santonin at bed time and castor oil in the morning with the result that she brought out 962 round worms, one of them through her mouth. On the 4th day I repeated the prescription and 125 more worms came out. On the 8th day the recipe was again repeated with no results. Microscopical examination of the faeces on two occasions showed no *Ascaris* ova. She was discharged from the hospital on the 20th day cured of her insanity and fits. She has been under my observation for the past two and a half months and, I am glad to say, is quite sound in health and brain.

### A CASE OF MENINGOCELE.

By A. BAYLEY DE-CASTRO,

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CASES falling under the spina bifida group are said to occur on an average of one per thousand births, and possibly in big lying-in institutions this average would make their occurrence "rather common," to quote Thompson and Miles.

I had one such case on the morning of the 4th July, 1929, when, after an uneventful labour, a living well-developed girl of 8 lbs. 2 ozs. was born, with an open raw surface  $2\frac{1}{2}$  inches long and 2 inches broad in the lumbar region. This raw surface was concave in outline, with the spinal cord clearly visible lying spread out in the middle line.

Palpation revealed a cleft in the vertebral arch, the result of non-closure of the primitive medullary groove. The edges of the wound presented the appearance of normal skin. One very significant fact was that no leakage was observed. The case was diagnosed as meningocele after careful consideration, and was confirmed as such radiographically later on.

I am of the opinion that rupture of the sac took place during delivery, the fluid escaping along with the liquor amnii, but the child showed no signs of collapse and cried vigorously shortly after birth, and also passed urine and meconium. No throbbing was perceptible in the anterior fontanelle on the child crying, and by compressing the wound laterally no bulging was noticed.

The bladder and rectum were not involved, but there was distinct paralysis of the lower extremities.

Two days after birth, i.e., 6th July 1929, the central area of the wound took on a tumorous aspect, which was bluish in colour and was formed by the delicate arachnoid membrane. The edges all around showed healthy epithelialization. On this day it was noticed that the bridge of the nose had fallen in.

On the 15th July 1929 the tension in the sac had greatly increased and sudden rupture with collapse and death being considered possible, the child was put on the seriously-ill list.

By the 19th July 1929 a remarkably tough healthy skin which was growing up from all around was converging to the centre, but as yet three thin bluish areas could be seen.

Trans-illumination showed a translucent swelling without shadow. The edges of the tumour were bony and each ununited spinous process could be definitely felt; the defect involving the 12th dorsal vertebra and the 1st, 2nd, 3rd, 4th and 5th lumbar vertebrae. The child fed well, and was otherwise quite healthy.

On the 30th July the swelling was sterilized with ether and iodine and 6.5 c.c. of cerebro-spinal fluid removed through the peripheral area with a sterile 10 c.c. syringe, the puncture being closed with collodion.

This little operation was carried out on an inclining table with the child's head down. No bad effect was observed. It was discovered at this operation that the tumour was loculated.

On 31st July 1929 the procedure of the previous day was repeated, and 20 c.c. of cerebro-spinal fluid removed. This was done, because (a) there was a slight leakage

of cerebro-spinal fluid at the most prominent part of the swelling, (b) to encourage epithelialization, and (c) to relieve pressure.

A radiograph taken on the 1st August showed the absence of spinous processes, though the laminae were present, i.e., an incomplete neural arch. It also showed a kyphosis in the lumbar region corresponding to the vertebrae where the spinous processes were ununited.

This was no doubt due to the absence of the bracing action of interspinous ligaments which were not acting in the mid-line.

From the foregoing it was apparent that:—

- (a) The condition was one of meningocele.
- (b) The dural lining in the neural canal was deficient posteriorly, and the neural arch incomplete posteriorly through the splaying out of the laminae and non-meeting in the middle line of the spinous processes.
- (c) Through this gap was a hernia of the arachnoid, practically covered with new epithelium growing from the edges.

On the 5th August the tumour had again filled, was very tense, and there was leakage, so another 20 c.c. cerebro-spinal fluid was removed.

The patient was finally transferred to Karachi on the 19th August for further treatment by the surgical specialist, and so I lost touch with her; but I heard subsequently that septic meningitis, which was always dreaded, developed suddenly and finally closed the scene.

The chief features in this case that make it of interest are:—

(1) Absence of hydrocephalus; the absence of bulging of the fontanelle when the child cried, or when the wound was compressed laterally.

(2) Paralytic talipes was totally absent, but a few days before the patient was transferred the big toe of each foot was seen to be flexed on to the sole.

(3) The child was in perfect health and even started to put on weight (9 lbs. 6 ozs.).

(4) The inter-loculated condition of the tumour. Although books do not mention this condition, I think it must be fairly constant if we consider the irregular meningeal adhesions which must occur in such cases.

### A SIMPLE METHOD OF TREATING SALIVARY AND OTHER GLANDULAR SWELLINGS.

By F. D. BANA, M.B., M.R.C.S., D.P.H., D.T.M. & H.,  
Jum. Hon. Aural Surgeon, J. J. Hospital, Bombay.

It is a well-known fact that enlargements of the pre-auricular gland and the parotid occur as complications of otitis media. The path of infection is evidently *via* the lymph or blood channels, and apart from the pain of acute otitis, there is much swelling and pain in front of the ear. If the mandibular joint is involved and in little children the fright of opening the mouth either for swallowing or for examination, completes the misery of the patient. It is rare for these two structures to suppurate when pus can be let out on incision, but I have noticed as in the following two cases that speedy relief can be obtained from both the swelling and pain by the simple expedient of sterile puncture. A 5 or 10 c.c. syringe with a sharp stout needle is sterilised and the needle pushed into the most prominent part

of the swollen gland after washing the skin with lysol and painting with liniment of iodine. One does not expect nor find pus, but there is withdrawn as much of the serous, or sero-sanguinous fluid, or even blood, as can be drawn by withdrawing of the piston. If the glandular swelling is very tense and hard no fluid can be withdrawn, in which case the needle should be dug in at various points as in exploring an abscess till some fluid can be removed. This is quite a simple procedure, but has given very striking results in the following two cases.

*Case No. 1.*—Master T., aged 7, was brought to me by the mother for swelling of the right parotid gland for 4 days. The pre-auricular gland was also enlarged. Beyond a little rapid pulse the boy did not complain of fever but of slight pain and fullness in front of the ear and inability to chew his food. No fluctuation was felt, the gland being very hard and tender. Evidently there was no pus formation. There was inflammation for which there was going to be a fight between the bacterial agent or toxins and the boy's defensive powers. But the actual battle had not been fought and there were no casualties in the form of pus or necrotic tissue. I was disinclined to interfere at this stage. So the usual time-respecting remedies were given, salicylates by the mouth and application of glycerine of belladonna locally. Asked to report after four days, there was no change one way or the other, but the swelling had increased. There were no signs of otitis, either of the external meatus or the tympanic cavity, or any inflammation. The membrane looked normal with no pain, nor ear-ache. The only way of explaining the enlargement of the parotid and the pre-auricular gland lay in bacterial infection from the mouth. (The tonsils, teeth and pharynx were apparently healthy.) It was now decided to interfere and I aspirated the pre-auricular gland and the parotid swelling by withdrawing a little fluid at a time, which was sero-mucus in type with hardly any blood in it. A sterile dressing was applied. Within 8 days the swelling completely subsided, at first slowly then later on rapidly and the boy was all right within a fortnight. I dare say if there had been no active interference, the swelling would have subsided of its own accord as soon as the defensive mechanism of the boy had been brought into play, but the question is, after how long? It would have been anything up to a month or two, and meanwhile the patient would have had to endure the inconvenience of a swelling, and pain and fear at mastication, and would have lost weight. Anyway it hastened the progress and lessened the duration of the treatment.

*Second Case.*—M. F., male, aged 45. A well-known Persian traveller, just returned from a rather tiring sojourn in Seistan, the south-east corner of Persia, presented himself with a history of being run down and having a number of boils on the arms and nose. The boils had been coming on for the last 15 days, first noticed in Karachi, but would not come to a head or burst. They were hemispherical, red-looking lumps, the size of a rupee and not very tender to touch. The one on the tip of the nose showed a point of pus which was incised and carbolic ointment applied. An injection of a 100 million dose of staphylococcal vaccine was given. Four days after the boils were just the same. Another injection of 150 million was given. On the 8th day a sudden swelling on the left side of the jaw appeared. It was a swelling of the sub-maxillary gland which was stony hard to touch, accompanied by oedema of the subcutaneous tissues over the left side of the jaw, neck and cheek. The patient, usually a strong athlete, seemed to be very nervous and anxious to know if the swelling would necessitate incision or operation. I assured him that neither was needed and suggested needling and withdrawal of fluid which in this case was sero-sanguinous. I removed about 1 c.c. of the fluid from the sub-maxillary gland and dressed it aseptically, giving 100

million of a staphylococcal vaccine. Within four days the swelling had diminished and blockage oedema gone. Within the next 10 days the swelling had vanished and the rest of the boils had also healed up.

In this case as well, one can say that the rapid diminution of the swelling was due to the vaccine which I believe was certainly helpful to a degree, but I maintain that the puncture helped this procedure at a critical time and once the pressure of inflammatory tissues was relieved the stewing in its own juice of the inflammatory products was stopped, the immunity rising rapidly. The puncture by itself is not curative. It mainly helps to lessen the duration of the attack on the organ and of pain, and gives speedy relief to the patient. This is the point which I wish to emphasise here, and if other surgeons would try the effect of puncturing at an early stage any tight glandular swelling say of the parotid in mumps and early buboes before suppuration, I believe a lot of relief from pain and swelling could be afforded and progress hastened.

#### A NOTE ON THE USE OF ULTRA-VIOLET RAYS IN THE TREATMENT OF LEPROSY.

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and

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THE success following the use of ultra-violet rays (hereafter mentioned as the "U-V rays") in the treatment of chronic skin diseases, prompted the writers of this note to try U-V rays in the treatment of the skin lesions of leprosy. Though the ætiology, epidemiology and pathology of leprosy are quite different from those of most skin diseases and diseases with cutaneous stigmata, we were determined to see if any change in the clinical course of the disease could be brought about by the judicious use of U-V rays in the dermal lesions due to leprosy.

After its use in a few cases of leprosy, we were really surprised to note the wonderful changes which U-V rays brought about in the skin lesions. We searched in vain the current literature for further guidance in our work; there is no available reference regarding the use of U-V rays in the dermal lesions in leprosy. The use of U-V rays is invariably followed by gradual disappearance of the mutilating and unsightly skin lesions, which are replaced by healthy-looking skin and there is clinical cure of the condition, so far as the skin lesions are concerned. Our leprosy cases, up to now, have been so few in number that we cannot at present give any final opinion on the place of U-V rays in the treatment of leprosy, but we believe that it is worth giving them a trial. U-V rays have proved so useful in our hands in this hospital that we publish this preliminary note with the hope that workers in this field will give it a trial. We do not claim U-V rays as the only specific for the cure of leprosy; what we do claim is that



U-V rays are as useful and essential in the treatment of leprosy as is potassium iodide (though not a specific, like arsenic in the treatment of tertiary syphilis).

In order to see whether the disappearance of the skin lesions is due to U-V rays only (and not due to any drugs) we did not give any drugs, whether specific for leprosy or not, in our last case (mentioned below) who was treated with U-V rays only and hygienic mode of living. We found the result to be excellent as before.

#### *Our Technique of U-V Ray Treatment.*

In all our cases, we give two to three minutes' exposure of U-V rays from a quartz-mercury-vapour lamp (Hanovia Standard Model) from a distance of thirty inches. We give the following course of treatment daily, as a preliminary preparation of the patient for U-V rays exposures. The patient is first given a simple water enema; he is then given a general massage of the whole of his body, and a steam bath, which is followed by a cold faradic current plunge bath. The patient is then exposed to the radiant heat rays of the Sollux lamp (Oeken Model), until he feels a little warm, when he receives the U-V rays.

#### *Last case (mentioned above):—*

Mr. I., aged 18 years, a student of the Aligarh University, a frank case of leprosy, was admitted on 2nd September 1929 in the out-patients' department of the hospital with the following complaints:—

Macular, depigmented, anæsthetic (leprotic) patches distributed over the skin of the following parts, anterior aspect of the left thigh, around the left knee-joint, side of the left leg, dorsum of the left foot, right leg and right foot, back of left wrist and of right hand. Duration, 4 months.

Contracture of left lower extremity at the knee-joint, resulting in its fixation at an angle of about 90 degrees. Mobility of the joint (flexion and extension) limited to 6 degrees only. Duration, one month and a half.

Constant and severe neuralgic pain along the course of the distribution of the sciatic nerve and its branches, for the last 3 months, for which the patient was having morphia, gr.  $\frac{1}{2}$ .

*Family history.*—There is no history of leprosy in his family.

*Past history.*—The patient does not remember to have come in immediate and intimate contact or association with any frank case of leprosy. He cannot trace the origin of his trouble.

*History of present illness.*—Six months back the patient took a bath in a shallow village tank. Next day he noticed swelling of his lower extremities, which disappeared in a few days. The patient was having irregular fever, off and on, since then. Since then the patient has had swollen inguinal glands (especially on the left side). Four months ago the patient noticed the anæsthetic patches, which first appeared on the right leg and then extended to other parts of the body in a couple of days, and neuralgic pain for the last three months. The patient can neither flex nor extend his left leg for the last one month and a half.

*Present condition of the patient.*—The patient is in what is called Muir's reactionary or inflammatory phase of leprosy, i.e., the stage when heroic treatment with active remedies may cause exacerbation of the disease. The distribution of the lesions is mainly on the extensor surfaces of his extremities. The patient can walk only with the help of crutches on account of the contracture of the left knee-joint and pain along the course of the distribution of the sciatic nerve and its branches.

*Physical examination.*—Symmetrical distribution of large, macular, depigmented, anæsthetic patches, with slightly raised margins, which are of ring-form (like those of ringworm). The skin is glossy, dry, and parchment-like with local thickening. Contracture of the left knee-joint, which is flexed at right angles. Mobility of the joint is limited to 6 degrees only. There is inflammation (sciatic neuritis) of the sciatic nerve and its branches, resulting in severe neuralgic pain in the left lower extremity. The inguinal glands are swollen. Trophic changes in the muscles and skin present. As the case is a frank one of leprosy no micro-section was done.

*Diagnostic points.*—(1) Depigmented, anæsthetic, cutaneous patches. (2) Thickened skin, which is dry, glossy and parchment-like. (3) Severe neuralgic pain showing inflammation of the sciatic nerve and its branches. (4) Fever off and on. (5) Contracture.

*Treatment.*—The same technique of U-V rays exposures, as outlined above for 35 days and passive movement and massage of the affected limb (knee). No drugs were given, either by the mouth or by injection. Diet was restricted to fresh fruits and sufficient quantity of fresh unboiled milk or its different preparations.

*Result of treatment.*—All skin lesions have disappeared completely; the skin looks like that of any healthy man and is free from any stigmata of leprosy. There is complete flexion of the knee-joint and the extension of the joint has improved considerably, though it is not yet complete and normal. Pain has improved a lot.

In conclusion we take this opportunity to thank our Chief, Dr. Ajit M. Bose, M.B., Ch.B. (Edin.), L.M. (Dub.), the Medical Director and Radiologist-in-charge, for giving us all possible facilities in the carrying out of this investigation.

(Note.—According to the writers the patient was in a state of reaction when he came under treatment and the improvement described above would probably have followed in the natural course of events, as the reaction passed off, even if no treatment had been given. No mention of improvement in nerve lesions, such as anæsthesia, is made, nor does a bacteriological examination appear to have been done. Furthermore, no details are given of the results of the treatment in the other cases.—EDITOR, I. M. G.).

## A FOREIGN BODY IN THE PERITONSILLAR SPACE.

By RADHA KRISHNA GROVER, B.Sc., M.B., B.S.,  
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A boy, Satya Bhosan, aged 12, felt great discomfort in his throat immediately after taking his meals. There was great retching and nausea, but no vomiting. The boy began to feel pain in the prelaryngeal region. My assistant saw the boy but could not find out the cause of the pain. I was consulted but I also was unable to express a definite opinion. While examining the throat I noticed something white and worm-eaten in appearance protruding in front of the left tonsil, hidden behind the left pillar of the fauces. I took hold of it with a pair of forceps and gently pulled it. To my surprise it came out. It was a bit of a loaf of bread about an inch long. Directly it was taken out, the pain and discomfort disappeared and the boy looked much relieved.

The peritonsillar space is, I think, an unusual site for a foreign body.

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## THE ACTION OF EMETINE ON *ENTAMŒBA HISTOLYTICA*.

THE medical practitioner in the tropics who is called upon to treat a case of chronic intestinal amœbiasis is faced with considerable difficulties, owing to the number of "amœbicides," "cures," and "specifics" for this condition which claim his attention. The "tests" to which these remedies have been put have usually consisted of examination of a few stools during or just after the cessation of treatment with the drug, and any laboratory worker of experience knows the valuelessness of such a procedure. An immediate disappearance of *E. histolytica* from the stools whilst the patient is under treatment is almost the rule with present-day remedies, whilst the stools frequently give "negative" results for a week or two after cessation of treatment; examination of stools in the third or fourth week after treatment, however, only too often shows that the "cure" has been a temporary one.

Under these circumstances, it is a pleasure to review a recent series of papers from the National Institute for Medical Research, London, by Mr. Dobell and his colleagues, distinguished by the most painstaking, careful, and laborious research, which summarise, once and for all, what is the action of emetine on *E. histolytica*. Taken together, the five papers constitute a symposium on the subject which every worker interested in tropical medicine should read in the original.

The first of these memoirs, by Dobell, Jepps and Stephens (1918) indeed dates back to the period of the Great War.\* One hundred and fifty-five persons suffering from infection with *E. histolytica* were treated by a course consisting of 3 grains a day of emetine bismuth iodide orally for 12 days. The criterion for cure was that after the cessation of treatment one stool in the first week, one in the second week, and four in the third week, should give negative findings. In no case was a relapse detected later than the end of the third week, and the authors consider the above standard of six examinations, of which four are to be made in the third week after the cessation of treatment, to be reliable.

\* In their review of the literature on the treatment of intestinal amœbiasis, Knowles, Das Gupta, Dutt Gupta, and Gupta (1928) unfortunately omit all reference to this memoir. They did not even know of its existence until their attention was drawn to it subsequent to the publication of their article.

Of 59 individuals who showed relapses, 46 of the relapses were detected during the first two weeks after the cessation of treatment, and 13 during the third week.

The first course of treatment consisted in all of 36 grains of emetine bismuth iodide in 12 days; and 121 out of the 155 patients, or 78.1 per cent., were cured. The most successful results were obtained by administration of the drug as an uncompressed powder in gelatine capsules; by this method 90 per cent. of cases were cured with a first treatment.

The 33 patients who relapsed now all received a second similar course of treatment (Table 5 of the memoir). Twenty were cured,—60.0 per cent., and 12 remained uncured. Of these, 10 received a third course of treatment, after which 2 more were cured. A residuum of 3 uncured patients received a fourth course of treatment, but still showed *E. histolytica* present.

The authors conclude that "a full course of treatment (36 grs.) with emetine bismuth iodide administered in its most suitable form will free the majority (probably about 90 per cent.) of carriers of *E. histolytica* of their infections. Of those cases which remain uncured after such an original course of treatment, a further number can be cured by the subsequent administration of a larger quantity of the drug. But even a quantity of the drug (72 grs.) equal to twice that originally given will not cure every carrier of his infection. There is, however, no evidence to show that the proportion of "incurable" cases is greater than 5 per cent. of all infected cases.... When cases remain uncured (after the first treatment) the best method of re-treating them is to give them a double course of the drug (3 grains daily for 24 consecutive days—72 grains)."

The thoroughness with which these patients were examined after treatment is without parallel anywhere else in the literature, as may be gathered from the following table:—

95	patients	gave	6	negative	examinations	each.
34	"	"	7	"	"	"
3	"	"	8	"	"	"
5	"	"	9	"	"	"
2	"	"	10	"	"	"
1	"	"	12	"	"	"
1	"	"	14	"	"	"
1	"	"	15	"	"	"

The patients treated in this large series were British soldiers, who would presumably withstand larger doses of bismuth emetine iodide than could be administered to weakly Indian patients. The authors note that "although most patients suffered discomfort during treatment, none displayed any serious constitutional symptoms; and almost without exception the patients stated, two or three weeks after treatment, that they felt very much better.... When vomiting occurred it was usually two or three hours after the administration of the double iodide, and it did not persist for more than a few hours. It

did not interfere to any great extent with the night's rest, and the patients usually had excellent appetites throughout the day. . . . Diarrhoea usually began about the fourth day of treatment, and generally ceased about two days after its termination. Cases suffering from chronic gastritis did not appear to suffer any greater inconvenience than the others."

It is not likely that opportunities for so exhaustive and so careful a clinical study, where convalescent troops can be kept under daily observation for weeks together, will recur; and it is largely upon this memoir by Dobell, Jepps and Stephens that the routine use of bismuth emetine iodide for the treatment of carriers rests.

With the introduction of cultural methods for *E. histolytica* in 1924, it became obvious that it would be possible to test the action of emetine on *E. histolytica* in culture. This was carried out in an extensive piece of experimental work by Dobell and Laidlaw (1926). Their conclusions were as follows:—

(1) Emetine and cephaeline have been found to be specific poisons for *Entamoeba histolytica* under cultural conditions.

(a) For this amoeba (in culture) these alkaloids are at least fifty times as poisonous as isoemetine, psychotrine, methylpsychotrine, demethoxyemetine or noremetine.

(b) For this species also emetine has been found to be about ten times as poisonous as Stovarsol, and about fifty times as poisonous as quinine—under identical conditions of experiment.

(2) *Entamoeba coli*, *Entamoeba gingivalis* and *Endolimax nana* have been found comparatively insensitive to the presence of emetine in cultures—*E. coli* being able to withstand a concentration of the alkaloid at least one hundred times that which is lethal to *E. histolytica*.

(3) The effect of solutions of emetine on *E. histolytica* are peculiar. Very strong concentrations (1 per cent. or more) are needed to kill this parasite instantaneously; but only very weak solutions (1 in 50,000 or less) are necessary to kill it if allowed to act for a sufficient time.

(4) In view of these findings it is concluded that the curative effects of emetine in human amoebic dysentery are best explained as a result of the direct lethal action of the alkaloid on *E. histolytica*.

This last point needs emphasis, as previous workers had held that the action of emetine on *E. histolytica* was an indirect one. Thus Dale and Dobell (1917) held that the action was an indirect one, basing their opinion chiefly upon the difference of action of emetine in man and in the cat; in man amoebic dysentery is rapidly checked by the administration of emetine; on the other hand administration of emetine to a cat suffering from amoebic dysentery does not influence the course of the disease, which is neither checked nor cured.

Sellards and Leiva (1923) claim that intra-rectal administration of emetine will prevent the development of amoebic dysentery in experimentally infected kittens, but this hardly amounts to the same as cure of an established condition of amoebic dysentery in the animal. It is possible, write Dobell and Laidlaw, that in the cat emetine is rapidly excreted by the kidney, and not sufficient of it reaches the colon to affect the *E. histolytica* infection; on the other hand, in man some of the injected emetine must be excreted into the colon, for its action upon the amoebae is very marked; its ultimate elimination is by the kidney over a period of some five to nine weeks.

Further, conclude Dobell and Laidlaw, the action of emetine on *E. histolytica* *in vitro* is so specific that the utmost caution must be exercised in drawing conclusions from experiments with emetine on free-living amoebae and other protozoa. "Emetine has a specific action upon *E. histolytica* in culture; and in this sense the alkaloid may perhaps be termed "amoebicidal." But it is also clear that emetine is not "amoebicidal" to amoebae in general—or even to all entozoic amoebae—since very strong solutions are necessary to influence the growth of some species. Moreover, the striking differences between the effects of emetine upon two such closely related species as *E. histolytica* and *E. coli* make it obvious that earlier results, obtained by similar methods but with cultures of more distantly related free-living species, are of very dubious significance. From the observed effect of the alkaloid upon one species it is clearly impossible to predict its action upon any other."

In their 1926 paper Dobell and Laidlaw did not pay attention to the possibility of adsorption of emetine from the fluid of the culture medium by the inspissated serum of the medium. This point appears to have occurred to them later, and it was fully investigated by Laidlaw, Dobell and Bishop (1928). They point out that recent workers, in publishing results, have used many different types of media; they often fail to give the necessary detailed data with regard to such matters; and their results are accordingly widely divergent and cannot be compared with one another. Having worked out a method for the detection of very small amounts of emetine, the rate of adsorption of emetine from the fluid to the solid portion of the culture media was investigated. It was found that with Boeck and Drbohlav's medium much more emetine is adsorbed by the coagulated egg portion of the medium, than is the case with the inspissated serum used in Dobell and Laidlaw's HSe + S medium.

This finding made it necessary to test the action of emetine on cultures of *E. histolytica* in entirely fluid media. The first tests were carried out on cultures in inactivated horse serum, diluted 1:8 with Ringer's fluid, and a little sterile rice starch added. Four different

strains of *E. histolytica* (one human and three simian) were tested, and it was found that emetine proved lethal to *E. histolytica* at dilutions up to 1:750,000. The end point, however, was not always sharp, and it was discovered that the final pH of the culture profoundly affected the minimal lethal concentration. The reaction of the fluid was therefore stabilised by adding 0.2 per cent. disodium hydrogen phosphate to the Ringer's fluid used, and adjusting the pH to 7.2. With this results were much more uniform; three of the four strains tested were killed by emetine at a dilution of 1:5,000,000; in the fourth case the culture became unduly acid, pH 6.2, and emetine proved lethal only in dilutions up to 1:750,000.

This paper is of very great importance to all

dysentery is probably due to the direct toxic action of the alkaloid upon the amœba.

The fourth memoir of the series, by Dobell (1929) with the co-operation of Dr. Ann Bishop, deals with the eradication of *E. histolytica* infections in *Macacus* monkeys. As Dobell has shown in previous papers every *Macacus* monkey which he has studied is infected with a parasite which he considers to be identical with *E. histolytica* of man. One of the greatest merits of this very fine piece of work is its detailed account of Mr. Dobell's methods of handling and dealing with his monkeys. Five animals were concerned, and had been under continuous—practically daily—examination and observation of stools for periods varying from 1½ to 4¼ years. They were as follows:—

Name.	Species.	Sex.	Age (years).	Weight (kg.).	Intestinal protozoa.
Polo ..	<i>M. sinicus</i> ..	M.	4	4.91	<i>E. histolytica</i> , <i>E. nana</i> , <i>Giardia</i> sp., <i>Enteromonas</i> , sp.
Jacko ..	<i>M. rhesus</i> ..	M.	4	11.65	<i>E. histolytica</i> , <i>E. nana</i> , <i>Giardia</i> sp., <i>Enteromonas</i> , sp.
Mungo ..	<i>M. sinicus</i> ..	M.	4	4.75	<i>E. histolytica</i> , <i>E. nana</i> , <i>Giardia</i> sp., <i>Enteromonas</i> , sp.
Susanna ..	<i>M. sinicus</i> ..	F.	5½	4.76	<i>E. histolytica</i> , <i>E. coli</i> , <i>E. nana</i> , <i>Giardia</i> sp., <i>Enteromonas</i> , sp.
Rosa ..	<i>M. rhesus</i> ..	F.	2½	4.13	<i>E. histolytica</i> , <i>E. coli</i> , <i>E. nana</i> , <i>Enteromonas</i> , sp.

workers engaged on similar problems, for it shows how very important may be the influence of such overlooked factors as the pH or the composition of the culture medium employed. The authors conclude as follows:—

1. When emetine is added to complex culture-media containing solid and liquid portions it becomes unequally distributed between the two constituents.

2. The distribution between the solid and liquid varies with (a) the nature of the solid, (b) the reaction of the system, and (c) the time.

3. An erroneous idea of the absolute toxicity of emetine for *E. histolytica* is obtained from a consideration of the results with such media (e.g., the egg-serum medium of Boeck and Drbohlav).

4. With a simple (liquid) medium it has been shown that a solution of emetine 1 in 5,000,000 is lethal for all amœbæ (*E. histolytica*—4 strains) *in vitro* within 4 days, provided that the medium does not become too acid.

5. This great potency of emetine *in vitro* may be altered by a comparatively small variation in the reaction of the culture-medium.

6. These results confirm the view that the therapeutic efficacy of emetine in human amœbic

Treatment was with bismuth emetine iodide by the mouth, since this had been found previously to give very much better results than the hypodermic or intramuscular injection of emetine. The double salt was made up in a 4 per cent. suspension in a strong solution of cane sugar in water, and the measured dose administered by a pipette. The doses were given just before the mid-day meal. The giving of the meal immediately after the dose of emetine bismuth iodide distracted the monkey's attention from what he had swallowed, and ensured that the dose given was retained. The fæces were collected immediately they were passed, cultures for *E. histolytica* were taken within a few minutes, and the stool emulsions made and microscopically examined whilst the material was perfectly fresh.

The experiments conducted fall into two series. To begin with, the author had no data to go upon with regard to the toxicity of emetine for *Macacques*, or as to how they would tolerate it. Further, it was desirable to carry out the first series of experiments with monkeys who showed no *E. coli* infection, for it is sometimes impossible to assign an individual amœba encountered in the trophic phase with certainty to either *E. coli* or *E. histolytica*. Accordingly the first three animals were selected.

*First Series of Experiments.*—These may be briefly outlined as follows:—

*Polo.*—Given 20 mgms. of B. E. I. daily for 22 days; total 0.44 gm. Examinations and cultures positive.

Result; failure.

*Jacko.*—Given 20 mgms. the first day, followed by 40 mgms. daily for 25 days; total 1.02 gm.

Examinations and cultures positive.

Result; failure.

*Mungo.*—Given 20 mgms. daily for 24 days; total 0.48 gm. Examinations and cultures positive.

Result; failure.

Although this series of treatments failed to eradicate the infections, yet they showed that monkeys of genus *Macacus* could stand the doses of bismuth emetine iodide given. The only one who showed any symptoms was Jacko, who became dull and listless towards the end of the course of treatment. All of them ceased to grow, however, and the normal increase in weight did not occur. They recovered very rapidly when the drug was discontinued.

*Re-treatments.*—As the dosage had proved too small to be efficacious in the first set of experiments, all three monkeys were next re-treated with larger doses. Details were as follows:—

*Polo.*—Given 40 mgms. a day for 15 days; total 0.6 gm.

Culture positive on the 4th day after cessation of treatment.

Examination positive on the 5th day after treatment.

Result; failure.

Next, given 60 mgms. daily for 7 days; total 0.42 gm.

Subsequent cultures and examinations negative for 26 days.

Result; cure.

*Jacko.*—Given 60 mgms. daily for 11 days; total 0.6 gm.

Examination and cultures positive on the 5th day after cessation of treatment.

Result; failure.

*Mungo.*—Given 40 mgms. daily for 5 days; then 60 mgms. daily for 13 days; total 0.98 gm.

Examinations and cultures negative for 30 days after cessation of treatment.

Result; cure.

*Second Series of Experiments.*—As it now appeared that treatment with a daily dose of 60 mgms. was likely to bring about eradication of the infection, and as the monkeys could just withstand this dose, the last two animals were now treated with this dosage. Details were as follows:—

*Susanna.*—Given 60 mgms. daily for 6 days; total 0.36 gm.

Examinations and cultures negative for 66 days after completing treatment.

Result; cure.

*Rosa.*—Given 60 mgms. daily for 7 days; total 0.42 gm.

Examinations and cultures negative for 66 days after completing treatment.

Result; cure.

It is clear from these experiments that an infection with *E. histolytica* in a *Macacus* monkey of about 5 kilogrammes weight can be eradicated by about one week's treatment with 60 mgms. of bismuth emetine iodide daily.

On the other hand, such a dosage is not free from symptoms in the monkey. Marked loss of weight was the most striking feature of the experiments, though when the treatment was stopped all the monkeys soon made good the loss in weight. Rosa was the only one of the five who failed to show symptoms of poisoning. Vomiting, diarrhoea, retching, salivation, yawning, and dermal irritation were the chief symptoms. Jacko, the heaviest animal of the series, showed as severe symptoms as any of the animals. On the other hand, all the monkeys recovered condition very rapidly when treatment was stopped, though some of them took a month to regain their normal weight.

It is perfectly clear from these experiments that infection with *E. histolytica* in *Macacus* monkeys can be eradicated by a sufficient course of treatment with bismuth emetine iodide. Now the weight of an average Indian male adult is given in the 8th (1928) edition of Lyon's *Medical Jurisprudence for India* as 110 lbs. (approximately 50 kilos); and the dosage given to these monkeys to eradicate the infection would correspond to approximately  $9\frac{1}{4}$  grains daily for an Indian male adult of ordinary weight; or to about 11 grains daily for an average adult male European. Such a dosage would undoubtedly prove toxic to man, though recovery after one week's treatment might be as rapid in man as in the monkey.

The bismuth emetine iodide had no action at all upon the other intestinal protozoal infections affecting these monkeys; these findings corresponding with what occurs in man also. This fact appears to confirm both the previous finding that the action of emetine is a direct and specific one on *E. histolytica* only of the entozoic amœbæ, and that *E. histolytica* of man and of the monkey are identical.

Hitherto "tests" for the "curative" action of any remedy in chronic intestinal amœbiasis have usually consisted in administering the drug for a few days, and examining a few stools either during or just after treatment. The memoir under consideration fully proves the uselessness of such a procedure as a test for eradication of an infection with *E. histolytica*. Dobell goes on to suggest that the natural

infections of *Macacus* monkeys may afford a suitable means for the proper testing of any proposed remedy. "In my experience" he writes, however, "macaques are not easy animals to use for experiments. They require individual personal attention, and can be successfully employed for drug-testing only by workers who are able and willing to devote months—or even years—to their care and study. I say this lest anyone might wrongly infer from the foregoing remarks that I am advocating the study of assorted chemicals upon "amœbæ" in "monkeys" by inexperienced workers. The reverse is my intention. I do not advise anybody to study the action of any drug upon any amœba in any monkey before he has familiarized himself with all the animals concerned, and I would warn him that this is far more difficult than it may appear at first sight..... I am nevertheless firmly convinced that advance in chemotherapy is not likely to occur—save by accident—through random experimentation with drugs of unknown and unpredictable activity, and with "tests" of "protozoa" in general. No discoveries of any practical importance to sufferers from amœbic dysentery are likely to result from crude trials made with speculative compounds upon free-living amœbæ of inaccurately determined species, upon *Paramœcium*, or upon other organisms only remotely related to *E. histolytica*. To me it seems infinitely more probable that progress will ultimately be made by carefully calculated attacks from positions already consolidated than by raids into unknown territory from insecure advance-posts."

As the author asks for criticisms, there is perhaps one point that the reviewer may be permitted to raise. The memoir by Laidlaw, Dobell and Bishop (1928) in itself,—and quite independently of the well-known work of Acton and of Sinton on the increased efficacy of quinine salts in malaria, when abundant alkalies are administered orally with them—shows the importance of the reaction of the substrate in which such an alkaloid acts. Daily doses of 11 to 13 grains of bismuth emetine iodide are too risky to use in man (though it must be admitted that the author does not suggest so heroic a dosage for man). Would it be possible to secure equally satisfactory results by using smaller doses, combined with the administration of large doses of alkalies? In all probability the action of emetine on *E. histolytica* is that of emetine base rather than of any emetine salt. The experiment at least would appear to be worth trial.

The last memoir in the series is one by Miss Bishop (1929) on the action of emetine on cultures of *Entamœba coli*. Two strains of this parasite were used; a strain from the above monkey Rosa, after she had been cured of her *E. histolytica* infection by treatment with emetine, and a simian strain experimentally established in man. The cultures were put up in (a) horse serum diluted 1:8 with Ringer's fluid,

but not buffered; and (b) in horse serum diluted with phosphate-Ringer's fluid 1:8. Solid rice starch was used in both media. The author's findings are as follows:—

(1) Two pure strains of *Entamœba coli*, differing in their bacterial flora, and experimental history, but identical morphologically, have been tested with emetine hydrochloride *in vitro*.

(2) In a buffered and wholly liquid medium, with a pH varying between 6.8 and 7.2, emetine hydrochloride was found to be toxic to *E. coli* in dilutions between 1:300,000 and 1:600,000, the toxicity increasing with the alkalinity of the medium.

(3) It is therefore concluded that emetine is about sixteen times as toxic *in vitro* to *E. histolytica* as to *E. coli*.

It is not likely that any drug suggested for the treatment of intestinal infection with *E. histolytica* will ever undergo as thorough an experimental trial as has bismuth emetine iodide at the hands of Mr. Dobell and his colleagues. The work is complete, exhaustive, and satisfactory. The conclusion to be derived from it is that in bismuth emetine iodide,\* we possess a really efficient agent for the eradication of intestinal infection with *Entamœba histolytica*. On the other hand, unfortunately the drug has to be given in almost toxic doses if the infection is to be completely eradicated. Perhaps the most important conclusion in the work is that the action of emetine on *E. histolytica* is a direct and not an indirect one. This may afford food for reflection to the school of experimental workers who propound the view that the action of all drugs in protozoal infections of man is an indirect one, and that protozoal parasites of man cannot be directly attacked by any drug.

R. K.

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\* The preparation used throughout was that supplied by Messrs. Burroughs, Wellcome & Co.



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## SPECIAL ARTICLES.

### A REVIEW OF SOME OF THE WORK BY OPHTHALMOLOGISTS IN INDIA IN 1929.

By R. E. WRIGHT, C.I.E.,

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IN the first week of January 1929, the Sixteenth Indian Science Congress met in Madras. Lieut.-Col. R. E. Wright, the president of the Section of Medical and Veterinary Research, gave his presidential address on "Ophthalmology in relation to research." It is quoted in full in the *Proceedings of the Indian Science Congress* published by the Asiatic Society of Bengal, and in the *Indian Medical Gazette* of May 1929. In addition to briefly setting forth the recent advances in ophthalmology, the speaker drew attention to the very great importance of the eye in the evolution of man, pointing out that in the opinion of distinguished anthropologists the development of the stereoscopic vision is the determining factor in the evolution of the primates, and the great elaboration of man's brain an attribute of bifoveate vision. The ultimate object of research—the advancement of the welfare of man—is thus fundamentally related to ophthalmological science.

Two papers on ophthalmological subjects were presented. Messrs. C. Narayanin and P. Govindarajaswamy of Pondicherry advocated chaulmoogra oil in the treatment of trachoma. (There does not appear to be general agreement in current literature as to the value of this method.)

A paper was presented by Lieut.-Col. R. E. Wright, Dr. K. Koman Nayar, and co-workers entitled "A preliminary note on an epidemic of superficial punctate keratitis" in which it was pointed out that an epidemic of this condition had been prevalent in and about Madras during the latter half of 1928. Some 500 cases had been observed, and an investigation was in progress at the Government Ophthalmic Hospital, Madras. The text of this paper was not published, but an abstract appears in the *Proceedings of the Congress*. A further report presented at the International Congress of Ophthalmology held at Amsterdam is referred to below.

In the *American Journal of Ophthalmology* Saradindu Sanyal contributes an article on "Colon bacillus infection of conjunctiva in adults." The muco-purulent conjunctivitis associated with corneal ulcer without hypopyon has to be diagnosed from other common muco-purulent infections. The original point of ulceration becomes deep and terraced, and a surface ulcer spreads over the cornea. Prognosis is good except for the interference with vision produced by the spreading ulcer. The diagnosis depends on the finding of Gram-negative rods and the cultivation of the *Bacillus coli*. The condition does not appear to be well recognized in adults.

He also records hernia of the vitreous under the conjunctival flap after cataract operation.

In the same journal Lieut.-Col. Wright describes a new type of cataract associated with the formation of minute hard opaque spherules in the lens, and quotes the reports of Dr. W. U. K. Christie of the Geological Survey of India as to their nature.

Elsewhere Col. Wright confirms the value of O'Brien's method of obtaining akinesia in cataract work by blocking the temporo-facial division of the facial nerve where it runs superficial to the neck of the lower jaw, and considers it an improvement on his own method of blocking the main trunk at the stylomastoid foramen.

In the *British Journal of Ophthalmology* Lieut.-Col. A. M. Dick and M. R. Sawhney report a "case of so-called coloboma of the macula." The fundus in the macular region of each eye showed a vertically ovoid white patch less than half the size of the disc. The patch included the fovea on the right side. There was no other congenital defect. The authors conclude that the condition was congenital coloboma of the non-pigmented type, although against this view it was pointed out that the patches were vertically ovoid, and a cholesterine crystal-like appearance suggested old hæmorrhage or inflammation.

In the same journal Lieut.-Col. Wright describes a "Hypopyon ulcer of the cornea due to *Glenospora graphii*." The appearances were those usually described for aspergillus ulcer. The bacteriological report by Col. Acton showed that the fungus belongs to the Aleurioporineæ of the genus *Glenospora*.

S. K. Mukerjee contributes a valuable article to the *Calcutta Medical Journal* based on a study of 253 cases of glaucoma occurring in subjects of epidemic dropsy during an outbreak in 1926. He hypothecates a toxic condition possibly acting on the ciliary capillaries. Non-operative treatment based on elimination of possible toxic substances was employed. Trephining was used successfully in a number of cases. The paper presents a mass of interesting detail and should be consulted in the original.

To the *Gazette*, Anklesaria contributes an instructive paper on "Detachment of the retina"

in which he records a complete cure in a myopic case. He reviews the main hypotheses which have been advanced to explain different varieties of detachment and then details his interesting case of reattachment.

R. Gubbay reports on the successful treatment of trachoma with chaulmoogra oil (*see above*).

Nanhoria gives an analysis of one hundred cases of cataract extraction at the Raipur Main Hospital by Smith's method with a flap conjunctiva with a fairly high complication rate.

Gnanadikam writes on "Causes of blindness" from the Swedish Mission Hospital, Tirupathur. It is a statistical report from that institution for ten months of the year 1928 and shows the importance of smallpox, keratomalacia, corneal ulcer, glaucoma and corneal scars. (It is difficult to assess the relative importance of the real causative agents from such statistics, inasmuch as one of the great causes of blindness shown, namely the corneal ulcer, is produced by a number of different conditions such as trauma, smallpox, keratomalacia, gonorrhoeal conjunctivitis and so on. For a true estimation of the causes of blindness one must know the ætiological factor, not the resultant damage to the eye.)

Varma publishes a note on the treatment of night blindness by sub-conjunctival injections of bichanide of mercury or 10 per cent. saline and claims that one injection was enough to cure. The claim seems astonishingly optimistic. The type of night blindness, the numbers treated, and the presence or absence of avitaminosis are not stated.

Jadavji Hansraj publishes a case of abscess of the iris. He points out that abscess of the iris is rare and not described in standard textbooks. (The clinical features quoted are perhaps not so rare, as the appellation abscess given thereto.)

Lieut.-Col. Wright draws attention to the practical value of Webster's operation for entropion of the upper lid.

An important editorial appears in the September number on "Preventable blindness in India" in which it is pointed out that much is being done both by Government institutions, medical missions, and voluntary organizations such as the Blind Relief Association, not only for the relief of blinding diseases but towards the prevention of those conditions which give rise to blindness. The latter is the huge problem to be solved. The essentials in the campaign are education and propaganda and the organizations mentioned might perhaps do more in this way. We are reminded that the blind are innumerable all over India to-day and that preventable blindness is one of India's biggest future public health problems.

The same issue reviews the Report of the Government Ophthalmic Hospital, Madras, for 1928 by Lieut.-Col. R. E. Wright, which can only

be very briefly referred to. The importance of blocking the seventh nerve (*see above*) and the ciliary ganglion, and the use of the bridge flap in cataract work are emphasized. There are a few errors in the review of the cataract section which a reference to the original makes clear. A clinical investigation was conducted on 100 glaucoma cases. Various non-operative measures were tried. The use of the adrenalin pack is mentioned. (An article on the value of this procedure was published in the *British Medical Journal*, Vol. II, 1929, by Lieut.-Col. Wright and Dr. Koman Nayar). The report also treats of lymphoblastoma of the orbit and allied conditions, an article on which was published in the *Lancet* for January 1929. Radium treatment as applied to a variety of orbital growths is described and interesting tables of the blood pressures of hospital patients given. Preventable blindness in the Madras Presidency and the importance of methods of prevention are discussed. Reference is also made to interesting case reports and the investigation of an extensive epidemic of superficial punctate keratitis (*see below*). The reviewer considered that the report should be read in the original by those interested in ophthalmic work.

The Thirteenth International Congress of Ophthalmology held at Amsterdam and the Hague in September 1929 was attended by a large number of ophthalmologists from all over the world and 250 communications were submitted. The subjects chosen for symposia were:

The ætiology and non-operative treatment of glaucoma: the geographical distribution and the international social campaign against trachoma; and the diagnosis of suprasellar tumours.

These were opened by Duke-Elder, Gronholm and Harvey Cushing respectively. It would be impossible in the space available to give an adequate idea of the nature of this great congress and its various activities. Full reports will be forthcoming in due course in the various ophthalmological journals. Committees dealt with such important subjects as:

Standardization of the visual examination of railwaymen, motor drivers, seamen and airmen, perimetry, notation of axis of cylinders, etc.

A directory listing ophthalmologists, ophthalmic journals, ophthalmic societies, hospitals and institutions for the blind was compiled. An International Association for the Prevention of Blindness was inaugurated, an antitrachoma league established, and much other valuable work carried out.

Two papers were presented from India and abstracts of them will appear in the *Transactions* of the Congress, one by Lieut.-Col. Duggan and B. P. Navati on "Two cases of quinine amblyopia with unusual ophthalmoscopic picture." The quinine had produced rapid blindness with cedema of the retina, vessels and discs remaining normal. The vision recovered, but

contraction of the fields remained in each case. The second paper by Lieut.-Col. Wright and co-workers was entitled "Superficial punctate keratitis, a record of an epidemic which appeared in Madras about May 1928 and continued during the year that followed, embodying observations relating to the clinical appearances, biomicroscopy, epidemiology, ætiology and histopathology of the disease on the investigation of over 500 cases." As neither the Congress abstract nor the full text of this extensive work will appear in print till the middle of 1930, it may be well to give the outstanding features of this interesting clinical research. It was pointed out that the disease met with in such an enormous number of cases was the same as that described by Fuchs in 1889, and subsequently mentioned in standard works. Forms were observed which embraced not only the type description but many varieties of keratitis described as independent entities in the literature and intermediate transitional forms. Under epidemic conditions the inclusion of such diverse forms in a common ætiological group was hardly questionable. The affection is apparently closely related to, but clinically distinct from herpes zoster ophthalmicus and herpes febrilis. The investigation undertaken by the Government Ophthalmic Hospital with the co-operation of the King Institute of Preventive Medicine, Guindy, essayed to elucidate the question of ætiology. A bacterial agent was excluded, but the disease was reproduced in the rabbit and man experimentally, using both filtered and unfiltered material. Finally inclusion bodies were demonstrated in the corneal epithelial cells at the site of the lesion. They were more suggestive of Negri bodies or the inclusions of variola than other varieties of cell inclusions. The conclusion seemed justifiable that superficial punctate keratitis with its very varied clinical manifestations was a disease of the herpetic group due to a filter-passing virus and that the occurrence of such distinctive clinical and pathological features is in favour of an independent herpetic syndrome not identical with herpes febrilis or herpes zoster ophthalmicus. To bring information up to date on this subject it may be stated that the epidemic on which this paper was based continued with increasing vigour up to the end of the year under review, over 3,500 cases having been recorded. It became more and more obvious as time went on that the variations in clinical appearances were even greater than originally supposed, the general characters changing markedly during the course of the epidemic. It is comparatively easy to make a diagnosis under epidemic conditions, but the more uncommon clinical types would be almost impossible to recognize when occurring sporadically without some criterion.

Much confusion undoubtedly exists in the literature in connection with this affection which recent experience in Madras will do much to clarify. The affection is apparently an independent virus disease, afebrile, and not

necessarily preceded by a febrile disturbance. It is presumably an air-borne infection, of unknown incubation period (under a week experimentally, shortest period observed under natural conditions one month), of sudden onset, attacking the conjunctiva and cornea, but not the skin. It more commonly involves the left eye, but may invade either eye or both. One attack does not convey immunity. It manifests itself as a rule by a greater or lesser degree of redness, swelling, and discomfort, in this order of prominence, associated with the appearance of minute lesions on these structures consisting of points of infiltration, which show on the conjunctiva as tiny elevations, and on the cornea as grey spots of various sizes. These do not show a tendency to ulcerate although the epithelium may be shed. The corneal appearances are extremely variable and can only be fully appreciated with the corneal microscope. The cornea may actually be spared, more frequently the conjunctiva escapes. Presumably the route of invasion is via the fifth nerve endings. There is always some degree of anterior uveitis, but deeper lesions have not been observed. The disease tends towards complete spontaneous recovery in less than a month in mild cases. In more severe cases round corneal macule may remain, sometimes for a prolonged period. Subsequent interference with vision is rare. The symptoms are commonly much milder than the external appearances would suggest and the bacteriological findings in conjunctival smears within average limits.

#### POST-GRADUATE COURSES IN EDINBURGH AND VIENNA.

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THE following notes, the result of recent visits to Edinburgh and Vienna, may be of interest to readers of the *Indian Medical Gazette* and especially to those who are contemplating going to Europe for post-graduate study.

*Edinburgh.*—It is best to stay somewhere near the Royal Infirmary. Rooms are easily procurable and are relatively cheap though by no means luxurious. A good room with fires, lighting, attendance and two meals a day costs about 45s. a week. A ticket for attendance at all the routine clinical teaching at the Royal Infirmary must be procured, at a nominal cost. Coaching classes are highly organised and more expensive. The best are those given by junior members of the Royal Infirmary staff and cater especially for the candidates for the F. R. C. S. Ed. examination. In such classes, as in the teaching at the Royal Infirmary, great emphasis is laid on a thorough knowledge of surgical anatomy, and all the latest work in surgical pathology is well taught.

The surgeons who seem especially worth following are Professors P. D. H. Wilkie and John Fraser, whilst Dott is exceedingly good in surgery of the brain and H. Wade in urogenital surgery. They are also exceptionally fine teachers.

Very few men go to Edinburgh for post-graduate work in medicine, but there are good opportunities for theoretical work in gynaecology and for seeing all types of operative procedures in all branches of surgery.

In short, Edinburgh is a very good post-graduate surgical school with special reference to the requirements of the examination candidate.

*Vienna.*—This is a splendid centre for acquiring a practical knowledge and technique in any branch of practice from the definitely clinical point of view. Liaison with the teachers is established through the American Medical Association, who are most cordial and helpful to strangers, and they run an auxiliary for fixing you up in suitable accommodation. Here as elsewhere it is a good plan to go first to a hotel and not to move until you have found other accommodation that suits you. The cost of rooms varies considerably, but a well-furnished sitting-room with adjoining bedroom in the vicinity of the main group of hospitals may be obtained for about the equivalent of two guineas a week, including a light breakfast. There are innumerable cafes and restaurants where meals of every description may be obtained at very reasonable cost, and if you are in a hurry a most palatable snack may be had at an automatic buffet where you obtain your selected food with a glass of beer or even of so-called Tokay by inserting small change in penny-in-the-slot machines. These buffets appear very clean and well run. There are also many smaller hotels and pensions for those who prefer them.

Whilst in Vienna, opportunity should be taken to visit its charming surroundings and its magnificent buildings and parks. Winter sports had started early in November only 3 or 4 hours away, and in midwinter can be reached for a 2d. tram ticket. Incidentally the trams run everywhere, all tickets cost 2d. and you can transfer through several trams to reach your destination, on the same ticket.

There is a wonderful opera season from September to May, and there are two good golf courses, with lot of tennis and bathing in the summer.

The principal group of hospitals, the Allgemeines Krankenhaus with the neighbouring Kliniken, situated close to the American Medical Association's rooms at Vienna IX, Alserstrasse 9, contains an aggregate of about 3,000 beds and has a large out-patient attendance (ambulatorium). There are also many other associated hospitals in the town with teaching facilities. There appear to be comparatively few Austrian medical students, and post-graduate instruction is almost the sole means of livelihood of the Docents or assistants to the Professors. These assistants are paid about £105 per annum but make a much larger income by teaching. They are usually men of many years of experience and special ability, and they nearly all teach in English, but their mastery of English varies considerably. They work all day long in the hospitals and do but little work outside. Their day begins at 8 or even at 7 (at least one starts at 6) and goes on to 8 or 9 at night. Thus the post-graduate must be ready to work at such hours, though he may find he has a long hiatus without classes in the middle of the day.

The cost of the teaching depends entirely on how many share it. The system is that a vast list of courses is posted up at the A. M. A.'s rooms, lasting according to the subject from 1 hr. (e.g., cisterna puncture), to 20 hrs. (systematic and operative gynaecology) or more. A limited number of men is taken for each course and each course is repeated as required. As an example, a course is given about twice a month on "sterility, Rubin's test and hysterography" from a clinical and practical standpoint, for 4 men, 4 sessions of an hour, i.e., at the same hour daily for 4 days. The cost is 5 American dollars an hour, which the men taking the course divide between them. The finance is all worked out by the A. M. A. and they collect and distribute the money. All courses are reckoned in American dollars but can be paid in Austrian schillings. The standard rate is 5 dollars an hour.

The courses may be either purely didactic, or practical with just the necessary amount of theory as you proceed. Both types are usually very good but in the writer's opinion the great value of working in the Vienna Hospitals is the remarkable opportunity it offers for practical

work. For example, where else can you examine with the cystoscope several pathological bladders in an hour, catheterising all the ureters (if you can) and doing the more usual cystoscopic operations, under the exclusive direction of an expert, and continue daily for so long as you wish, for 5 dollars an hour? In Vienna there are a dozen men whom you can go to, but if you undertake such work it is really better to go and see them privately and arrange a suitable hour.

At the same time, if you take individual tuition it naturally increases the expense, which may easily come £3 or £4 a day for tuition alone.

Here I should like to emphasise a point that I consider very important: do not wait long for the A. M. A. lists to fill if you are at all pressed for time. If the course you want hangs fire go and see the A. M. A. orientation man for that subject about it, or better still the teacher himself. If you arrange personally with a teacher you pay the teacher direct, not the A. M. A. This organisation will not like your doing this, but it is often the only way to get the work you want if you are in a hurry.

Cadaver surgery is easily obtainable in any branch. It costs the usual 5 dollars an hour to the demonstrator with a tip added for the porter at 4 or 5 schillings a body. A schilling is 7d.

One is inclined to be surprised in these clinics at seeing what a hold the manufacturing chemists have over the therapeutic armamentaria of all the teachers from the professors downwards. I have in my notebooks the names of dozens of drugs, mostly of recent introduction, with proprietary names (and often of concealed composition) which are used and recommended officially. In most cases the active principle or approximate formula is given by the maker, but some of the teachers seem quite content to let it remain in their minds under its mystic trade name. For example, a drug was being recommended as a sedative and hypnotic, but the teacher had no idea to what pharmacological class it belonged although its full chemical name was printed on the container and revealed it as a member of the Butane group.

There are of course numerous other centres in Europe where facilities for post-graduate study exist, but they are not so highly organised as at Vienna. In Buda Pest and Prague and elsewhere operations can be bought. You pay a certain amount to your teacher and do the operation under his direction, but you must satisfy him of reasonable preliminary competence and you are not welcomed by his regular assistants. But Buda is so beautiful and so interesting that it at all events should be visited, by steamer in summer, a lovely trip of 14 hours down the Danube; by train or by air in winter. The latter is pleasant and well organised. A party of us hired 4 aeroplanes for this trip.

## Part II.

*Clinical Notes.*—It is thought that a few notes illustrative of current opinion and practice in Vienna may be of interest. It is regretted that they do not cover more than a very limited group of subjects.

*Urology.*—It is very unusual for any anæsthetic to be used in cystoscopy, and even fulguration treatment may be carried out without anæsthesia provided the terminal is kept in contact with the growth and not allowed to touch the bladder wall.

For pyelography, "umbrenal" is used. This is a strong solution of lithium iodide, about 33 per cent, and is considered much safer than sodium bromide. It appears probable however that the days of pyelograms made with the ureteric catheter are numbered on account of the recent introduction of a very important new group of drugs administered intravenously, just as sodium tetraiodophenol-phthalein (often called STIPP for short) is used for making cholecystograms. One such drug is called Uroselectan and another is Pyelognost. I saw the former used in several cases and was struck by the splendid pyelograms obtained and by the fact that as a rule the patients appeared to stand the drug without any ill effects.

This new method has a number of obvious clinical advantages. It does not depend on the often difficult and occasionally dangerous procedure of passing a ureteric catheter. It is less unpleasant from the patient's point of view. It outlines not merely the pelvis of the kidney, but the secreting tubules and medulla and the ureters of both kidneys at once and continues giving good pictures for 2 or 3 hours.

Drugs of this class are at present being used only experimentally and are not for sale even to hospitals. It is reasonable to suppose however that the method will soon be past the experimental stage.

It is perhaps advisable to emphasise that a very great deal of valuable information in kidney and bladder diseases, to say nothing of treatment, can be obtained by cystoscopy, chromocystoscopy and ureteral catheterisation which the above new method cannot supply. Moreover really good X-ray plants are required for pyelography and even then pyelograms are often very difficult to read. In fact, they must be read only in conjunction with the other methods detailed.

In Vienna many cases of "chronic appendix" in women are treated by drainage of the right kidney with the ureteric catheter. Of this drainage more below.

For outlining the bladder 25 c.c. of Iodipin oil is injected per urethram followed by an equal amount of air.

**Chromocystoscopy.**—The dye used for testing renal function is 5 c.c. of 0.4 per cent. indigo carmine by intramuscular injection. This should appear simultaneously from each ureter in 5 to 12 minutes. The test is carried out by passing both ureteric catheters, then withdrawing the cystoscope and letting the catheters drip into two test-tubes. The kidney pelvis are thus drained and the patient can be put comfortable while the appearance of the colour is being looked for.

Many cases of pyelitis, especially in pregnancy, are cured by passing a ureteric catheter about 10 to 15 cm. up the ureter, i.e., above the brim of the pelvis where the ureter is subject to the pressure of the pregnant uterus, and leaving it there from 24 to 36 hours, by which means the muscular tone of the ureter and renal pelvis is given a chance of being restored.

Pyelitis that does not yield to internal medicines can usually be rapidly and greatly improved by lavage of the renal pelvis per ureter with weak solutions of silver nitrate, and a clear urine obtained after prolonged pyuria. This of course presupposes a primary bacillary pyelitis and not one secondary to a calculus or growth. Further, no attempt at such local treatment must be made in renal tubercle.

**Gynaecology and Obstetrics.**—Hystero-graphy is rarely performed except to distinguish congenital malformations of the uterus, e.g., in the diagnosis between ectopic pregnancy and pregnancy in one horn of a bicornute uterus.

It is held that Rubin's test supplies with very little danger nearly as much information as hystero-graphy and that the latter should not be done if Rubin's test shows one or both tubes to be patent. The apparatus used is very simple, an air bellows as for a Junker or even a good 20 c.c. syringe, a mercury manometer and a Rubin cervical cannula fitted with a little clamp adjustable to take the handle of the volsella. No anæsthetic is needed, or at most a little novocaine into the *portio*. Perturbation by the same method is also used when the tubes have been artificially opened, both at the operation and daily for the first four days after, to maintain their patency.

#### X-RAYS AND RADIUM IN GYNÆCOLOGY.

**Cancer cervicis uteri.**—The preoperative use of x-rays in cancer cases is not in vogue because (1) it is held that intra-abdominal healing is much delayed, and (2) the inflammatory induration so commonly found associated with the cancer keeps in check the spread of the cancer cells along the lymphatics, although its removal by the radiation certainly facilitates the operation. Radium (in conjunction with x-rays) is only used in inoperable cases and there is a return to its local application as against deep insertion of needles whereby

the bladder or ureter is so frequently injured. Radium is not used where the rectovaginal septum is definitely infiltrated with growth for fear of early development of a recto-vaginal fistula.

**Chorion-epithelioma.**—X-rays are preferred to operative treatment, this type of cell being of course particularly susceptible to radiation.

**Post-operatively, radium is not used.** X-rays—the technique of Warnekros of Berlin—is favoured in preference to the Erlangen. The finest and most modern apparatus is needed so that the x-ray tube may be far enough from the skin to eliminate nearly all but the most penetrating rays and yet require not too tedious an exposure. A full carcinoma dose is given, as soon as the patient has regained control of the bladder, i.e., usually 3 or 4 weeks after operation, and this may be repeated at intervals of 3 months.

**Other Uses.** There is a conspicuous vogue at present for irradiation of the hypophysis, *per fossas temporales* for the following conditions in which it is said to give excellent results. There is no danger of injury to the brain, as the brain cells and nerve fibres are not liable to growth by cell division after infancy, and are therefore extremely resistant to radiation.

1. Severe primary dysmenorrhœa and menorrhagia, or for amenorrhœa, in young girls where ovarian stimulation is desired. It is specially pointed out that although good effects can be obtained by stimulation of the ovaries by rays and the patients may resume normal menstruation later, their children are small and unhealthy and show a liability to tuberculosis. In animals where the same ovarian irradiation is given, the third generation are sterile. It seems that ovarian radiation whilst destroying the full grown ova permanently damages the immature ones so that although they ultimately may be fertilised they are weak or defective from the start. In a series of 70 who after radiation later became pregnant, the miscarriage rate was doubled and two children were grossly deformed. Hence pituitary radiation, which gives as good results clinically, is preferred.

2. For climacteric depressions where no definite psychosis is present, and for relieving the symptoms of the post-operative menopause if these are severe.

3. In pruritus of pregnancy.

Hyperthyroid patients are refractory to the above treatment.

Radiation of the Spleen: 1½rd erythema dose for early control of menstrual hæmorrhages, to be repeated each period. Also for subinvolution with red lochia. And for hæmophylies before operation.

Radiation of the liver might be tried for the anæmia of pregnancy, although this appears to yield to a few small blood transfusions by the indirect method.

Irradiation of the abdomen gives excellent results in tuberculous peritonitis with or without laparotomy. Dosage 1½th ovarian dose daily for 10 days. This is regarded as the best treatment for tuberculous peritonitis.

**Fibroids.**—X-rays are regarded as a very suitable treatment for fibroids, but only for those which produce no other symptom except severe and prolonged menstrual bleeding. In all other cases operative treatment is preferred.

It is perhaps advisable to add that the x-rays referred to are the hard rays, not those used for diagnostic work.

**Kielland Forceps.**—Kielland forceps are almost exclusively used in the obstetric clinics, and their application is very well taught by the aid of a phantom pelvis with rubber fittings and a preserved still-born foetus. The course of instruction and practical work given to post-graduates in their use lasts for 3 sessions of an hour each. It is held that these forceps can be applied in all cases where forceps are of use and in many high cases where no other forceps could be applied. Certain points however must be observed in using them in high (unengaged) cases to avoid the accidents that have brought them under suspicion in some quarters.

Among these are:

1. The pelvic curve must be pointed towards the presenting part, e.g., occiput. The anterior blade is inserted first, but with its cephalic concavity directed *forwards* until it has completely passed the symphysis. It is then allowed to rotate away from the presenting index for 180° to engage the head anteriorly. In introducing it, with the patient in the dorsal position, the handle must be depressed well down towards the coccyx as soon as the other end is past the anterior lip of the cervix. As regards the rotation, there is a dot on the side of each blade handle to indicate which direction this rotation should go, but if the blade will not rotate easily in that direction it is probable that the diagnosis as to side of presentation is wrong and in that case the blade will be found to rotate readily the other way.

2. The anterior blade having been applied, the posterior follows the sacral curve and is easily applied and locked. This lock is really a slot and allows one blade to be at a slightly different level to the other by a sliding action.

3. When the head is brought past the brim, an indication must be looked for that it has reached the level at which it will rotate into the antero-posterior diameter. Rotation is then performed with the forceps, but there must be no pulling downwards during this, but on the contrary the head must be pushed back a little to relax the tension on the vaginal wall. The severe tears in the upper part of the vagina, usually circular and sometimes complete, reported after the use of these forceps, are held to be solely due to a disregard of this most important rule.

4. The last step in the delivery of the head is not a pull but a leverage upwards of the handle over the symphysis.

5. In dealing with the after-coming head, the forceps can be applied either in front of or behind the body, as is most easily done.

6. Catheterisation of the bladder is deprecated by Kielland because so long as the bladder is not empty it will remain above the pelvic brim and will not be nipped between forceps and symphysis.

The use of forceps in labour under hospital conditions is more frequent. It is held that the damage to the muscular and fascial components of the pelvic floor so commonly followed by prolapse and cystocele is caused by the prolonged overstretching it has been our custom to encourage and applaud. As a corollary, episiotomy is a common procedure.

It is worth noting that the great majority of foreign obstetricians visiting Vienna go away with a pair of Kielland forceps in their baggage!

*Placenta previa*: Caesarean section is reserved for primiparae with central or marginal placenta, bleeding through undilated os. Other cases are treated by rupture of the membranes, and the application of Willett's scalp forceps is replacing the Braxton Hicks method of podalic version.

*Eclampsia*: Conservative treatment with sedative drugs holds the field.

*Thymophysin*: this drug, which is a mixture of extracts of pituitary and thymus, is in use in all the teaching obstetric clinics in Vienna and very widely in Germany; it is given in place of pituitrin in labour. It produces regular contractions of the uterus, never tonic or spasmodic and is used in all stages of labour freely. It was recommended by Prof. Werner in his systematic lectures to post-graduates last autumn and is highly spoken of by the teaching assistants.

#### MISCELLANEOUS.

*Blood Transfusion*.—Both direct (whole blood) and indirect (citrate) methods are used, direct to replace blood lost by hemorrhage and to combat infections, indirect to stimulate blood formation. The former is given once as a big transfusion, the latter in a number of smaller amounts once a day or as required.

Transfusion for hemorrhage is much less common than formerly: cases with normal pulse rate and blood pressure recover with hot drinks, etc.; cases with normal

pulse rate and low pressure or with rapid pulse but normal pressure by intravenous saline ("normosal" is used) and only cases with rapid pulse and low pressure are given blood. In septicæmia, immuno-transfusion is advocated but without much enthusiasm, and the usual methods of protein therapy and administration of colloidal metals and of iodine are freely used under their proper indications.

*Varicose Veins*.—The method used is to immobilise the blood in the vein by two tourniquets about an inch apart, and to inject into the portion thus isolated 60 per cent. lavulose to distention. This appears effective under the technique taught and is certainly far less irritating to the tissues than salt, salicylate or rather, sclerosing fluids when a little escapes under the skin.

*Anæsthetics*.—Every variety of anæsthesia is in use. Open ether is perhaps the favourite, but a good anæsthetist seems hardly more common in Vienna than in India. *Spinal* must not be used for small operations as it produces headaches much more frequently in these than in bigger procedures. Duttner says his needle, which is a double one, the inner one being of very fine calibre, does not produce headaches.

*Acterin* is very well thought of, but a little general anæsthetic is always wanted in addition and the half-hour or so needed for it to take effect is a nuisance in hospital practice. However it is likely to be much used in future, especially in private practice and for nervous patients.

Finnsterer follows his coeliac technique, which gives splendid relaxation and almost no shock.

Sacral and parasacral anæsthesia are both used, and so of course is infiltration and nerve blocking in all their varieties. A good description of these can be found in Ogilvie's *Recent Advances in Surgery*.

Percaïne is spoken of as by far the best local anæsthetic both for mucous membranes and for infiltration. In the latter case, it is used in 0.05 per cent. solution, can be boiled, keeps well, and before use 1 per cent. of 1 in 1,000 adrenalin to be added. It is of recent introduction and of Swiss origin. Is it possible the ideal local anæsthetic has at last appeared?

It seems remarkable that such excellent surgical results are obtained where both the anæsthetic and nursing arrangements appear somewhat primitive. As regards the nursing, this is largely done by *religieuses* who appear to have neither the numerical strength nor the professional prestige to which we are accustomed. They are certainly very hard-worked. The patients are long-suffering and submissive, and are remarkably good to each other in the way of helping all they can in the wards. Even many who appear very ill may be seen doing nursing and menial duties. The wards are more crowded than is our custom. They are very clean, of a bleak soap and water cleanliness rather than of polish and glazed tiles.

## Medical News.

### A HOT WEATHER IDYLL.

As our military readers know, the Great War was associated with an almost universal prevalence of that distressing malady *Taniasis rubra* (infection with the red-tape worm). We have received from a correspondent the following fragment, dug out of an old record. Unfortunately it ends abruptly, and one does not know whether the "Hog, hedge, 1" ultimately secured any diet or none. The correspondence is vouched for as genuine.

*Scene*.—Mesopotamia in July. Maximum daily shade temperature about 125°F.

Correspondence between the O/C. Ration Department R.A.S.C. and the O/C. Central Laboratory.

I. From O/C. Rations to O/C. Laboratory. Memo. "Your indent of 2nd instant states that you require grain and fodder for 147 animals. Please



classify these animals and quote your authority for including them on the ration list."

## II. From O/C. Laboratory to O/C. Rations. Memo.

"The animals referred to are those required for laboratory diagnosis. No special sanction has been obtained, but they are referred to in *Field Medical Annual*, Vol. V, Footnote to para 178.

'Equipment. Accessory, laboratories, for the use of.'

## III. From O/C. Rations to O/C. Laboratory. Memo.

"In reference to your memo of 9th instant, it is essential that the animals should be classified under the usual headings in order that they may be admitted to the ration strength of this Corps. Please return them under their respective headings as under, which are the animals sanctioned on the strength.

Horses over fifteen hands.

Horses under fifteen hands.

Horses, general service.

Ponies, grass cutts.

Ponies.

Bullocks, draught.

Bullocks, milch.

Asses, country.

Any alterations in the ration strength of the animals under your command should be reported to me by wire immediately on said increase or decrease."

## IV. From O/C. Laboratory to O/C. Rations. Memo.

"The animals under discussion belong to the following classes and you are requested kindly to lay down for my guidance the daily ration of each in (a) grain, and (b) green fodder.

Hares, Belgian	..	..	62
Pigs, guinea	..	..	84.
Hog, hedge	..	..	1."

## V. From O/C. Rations to O/C. Laboratory. Memo.

"In reference to yours of 14th instant, I have to inform you that in consultation with the Divisional Officer Commanding R.A.S.C. and the Director-General Local Resources I have fixed the following scale for the rations for said animals and this should be adhered to by all animals under your command.

Hares, Belgian, per head per diem	..	..	grain 1½ ounces.
			lucerne 2 "
Pigs, guinea, per head per diem	..	..	grain 1 ounce.
			lucerne 1½ ounces.

Hog, hedge, may be classed for this purpose as a Pig. guinea.

Requirements should be submitted daily before 8 a.m., and the animals should be returned in the following classes:—

(a) Sucklings; (b) partially weaned; (c) weaned; (d) on full diet. The amounts of food-stuffs sanctioned for each of above classes should be calculated as 1/17th, 1/11th, 1/6th and 1/1th respectively of amounts sanctioned above."

## VI. Telegram from O/C. Laboratory to O/C. Rations.

"Begins. Your memo dated 12th instant, ration strength of animals referred to increased from 147 to 194 in last three days. Please correct accordingly. Ends ack ack ack."

## VII. Memo from O/C. Laboratory to O/C. Rations.

"Reference your memo No....., your order re. marginally quoted animal being classed as 'Pig. guinea,' is inadmissible as this animal Hog, hedge refuses to consume rations provided and requires insect food. Please arrange."

## VIII. From O/C. Rations to O/C. Laboratory Memo.

"Regret to inform you that insects are not an issue in this department. Please try Director-General of

Agriculture, quoting his *Field Manual*, Vol. XXVII, para 2794(62 (a), ii.

'Eggs. Ant's, canaries, for the use of.'

If not in stock try the Medical Store Department which has an issue of insects (vide *D.M.S.M. Standing Orders*, 1916, para 272 (d) 3) under the sub-heading of 'leeches, medicinal, medical officers, for the use of.'

## THE INTERNATIONAL SOCIETY OF MICROBIOLOGY.

At the International Conference on Rabies, held in Paris in April 1927, it was decided at a meeting presided over by Professor Madsen of Copenhagen to found an International Society of Microbiology. The object of the Society is not only to stimulate scientific advance by creating a more active co-operation between the workers in different countries, but also to foster the idea that Science should unite the nations in an ideal of durable peace and solidarity of investigation. It was decided that the subjects dealt with by the Society should not be limited to bacteriology, but should include also the other sciences included under the comprehensive term "microbiology,"—such as parasitology in its widest aspects; medical, veterinary and agricultural microbiology; botany; mycology, etc.

The Society will hold international congresses from time to time in different countries. The First Congress will be held in Paris from the 20th to the 25th July, 1930, under the presidency of Professor Jules Bordet of Brussels. The programme for this Congress is an extremely interesting one. Of the three sections of the Congress, the first deals with medical and veterinary microbiology; Professor Bordet, Dr. d'Herelle, and Dr. Ledingham will deal with the questions of microbial variation; Dr. Flexner and Dr. Levaditi amongst others with neurotropic and filterable viruses; Dr. Kitashima with the pathogenesis of cholera; and Dr. Pfeiffer with influenza. The second section will be devoted to serology and immunity; and here Dr. Sachs will deal with the rôle of lipoids in immunity. The third section deals with parasitology and botany; here Dr. Buchanan and Professor Uhlenhuth will deal with spirochaetes of water origin, Dr. Nicolle with blood inhabiting spirochaetes, and Dr. M. Mayer with Bartonella and similar infections in splenectomized rodents. Numerous special conferences and demonstrations have been arranged; these include an address by Professor Calmette on antituberculous vaccination, demonstrations by Dr. Borren on tissue cultures, one by Professor Inada on spirochaetosis icterohæmorrhagica, and one by Col. Russell, I.M.S. (retd.), on malaria. A special commission at the Congress will also concern itself with the difficult question of nomenclature in microbiology.

National committees of the International Microbiological Society have already been formed in twenty-three countries, and the importance of having such a committee in India is very obvious.

The fee for attending the Congress is 100 francs, and the Treasurer is M. Georges Masson, Editeur, 120 Boulevard Saint-Germain, Paris (VI). Messrs. Thomas Cook and Sons are arranging for accommodation and railway travel.

## ALL-INDIA OPHTHALMOLOGICAL SOCIETY.

The First Annual Meeting of this Society will be held in Bombay on the 17th, 18th, and 19th of April 1930. Those who are desirous of joining the Society and of reading papers at the First Annual Meeting are requested to communicate immediately with Dr. G. Zachariah, Hon. Joint Secretary, Flitcham, Marshall's Road, Egmore, Madras. The annual subscription to the Society is Rs. 15. The proceedings of the First Annual Meeting will be published in volume form as soon after the meeting as possible, and sent to all members."

## Current Topics.

### Observations on the Treatment of Pleuritic Effusions.

By Sir THOMAS HORDER, Bt., K.C.V.O., M.D., F.R.C.P.  
(Abstracted from *The British Med. Journ.*, October, 5th, 1929, No. 3587, p. 605.)

IN the first place, it is necessary to stress the fact that the successful handling of a case of pleuritic effusion does really rest upon principles, more or less clearly definable, and that the appropriate treatment of the effusion depends upon a consideration of several factors:

1. The cause of the infection.
2. The nature of the effusion.
3. Its size.
4. The stage in the disease process at which the patient has arrived.
5. The associated condition of the lung.
6. The degree of illness of the patient.
7. The contribution made by the effusion, as such, to the illness.

The time-honoured division of effusions into serous, or sero-fibrinous, and purulent is justified both on clinical and on bacteriological grounds, and brings into close association the first and second of the above-named factors:

1. *Sero-fibrinous Effusions*.—Tuberculous; rheumatic; influenzal; lymphadenomatous; some other infections; neoplastic.

2. *Purulent Infections (including Empyema)*.—Pneumococcal; streptococcal; staphylococcal; influenzal; mixed infections; gonococcal; coliform; streptothrix.

The stage at which the disease process has arrived when effusion is diagnosed is a fact of great importance in the decision whether to remove the fluid, and also by what method to remove it. To remove all effusions "at sight" is, undoubtedly, bad practice, and this statement applies alike to purulent as to serous effusions. Care must be taken, however, not to confuse treatment with diagnosis. It is assumed that no effort is spared to make the diagnosis as early as possible; it is also assumed that no one is ashamed of a negative pleural puncture; better a negative puncture too early than a positive puncture too late.

The associated condition of the lung should be assessed with as much care as possible. Active and acute inflammatory changes in this organ contra-indicate removal of pleuritic effusion, *ceteris paribus*, and this is true whatever the nature of the infection, because the presence of the fluid is undoubtedly of conservative value in keeping the lung at rest.

But the accumulation of fluid adds toxic and mechanical factors to the patient's illness, and these must be taken into account in determining treatment of the effusion. The question often arises; to what degree is the patient handicapped by the presence of the fluid, and to what degree is he ill by virtue of his general, or his pulmonary, infection? The proper answer to this question can only be given after the exercise of judgment based upon experience.

Lastly, it is necessary to carry in mind how ill the patient is, though this has more bearing upon the manner by which the effusion is removed, and the rate at which it is removed, than upon the question whether or not it be dealt with.

#### 1. Serous Effusions.

The great majority of these are tuberculous in origin. Their treatment follows traditional lines. If they are very large effusions they are tapped as soon as they are diagnosed. If they are associated with respiratory or cardiac distress, and this seems referable to the effusion

rather than to other factors, again they are tapped as soon as diagnosed, and irrespective of their size. Thirdly, if they show no signs of (further) absorption after fourteen days or so from the date of their discovery, they are tapped. Too early an interference with serous effusions is meddlesome. There is a definite evolution in the exudative process consequent upon the disease, so that the fluid tends to collect again if removed before its high tide is reached. But a more important reason against premature removal of the fluid is that by such interference the associated collapse of the lung is interfered with, and its expansion encouraged. Should the lung itself be the seat of active tuberculous disease such expansion tends to increased activity, and if it be not itself involved its partial collapse protects it from infection from the pleura. Several days of observation of the patient are sometimes necessary in order to decide if the lung is, or is not, involved, and in cases of doubt it is better to assume that it may be. Too late an interference with a serous effusion, on the other hand, is prone to leave the lung permanently collapsed, with consequent deformity of the chest and scoliosis.

If there is evidence that the lung is diseased, and in proportion as this evidence is definite, even greater care must be exercised against too hasty removal of the liquid effusion. Our experience of the good result of collapse therapy in the treatment of some cases of pulmonary tuberculosis has an obvious bearing upon this matter. The replacement of the effusion by oxygen may be considered, and this is sometimes done with excellent results. The production of active symptoms of lung disease is not infrequently witnessed as the result of the rapid expansion which follows removal of a serous effusion when a latent focus of tubercle is present. Less often, but more serious still, a pneumothorax, with all its lamentable consequences as a complication of pulmonary tuberculosis, ensues from the same error in practice.

Whilst this policy of forbearance is in operation the doctor is not idle. The patient is, from the first, regarded as suffering from tuberculosis, and the general measures that follow upon this view are put into action. The arm on the affected side is immobilized; perhaps that side of the chest is strapped, unless it be decided to paint the skin with equal parts of the tincture and the liniment of iodine, or to apply some other form of counter-irritation. Iodides are given internally, and calcium is thought by some to be of service.

Expectant treatment of serous effusions, followed by simple removal of the liquid at a well-chosen time in those cases in which it does not undergo spontaneous absorption, is so successful that to complicate it by or to substitute for it, other methods seems a matter of supererogation.

*How to remove pleuritic effusion*, when the conditions indicate this need not be dealt with here in detail. With most practitioners the Potain type of aspirator is deservedly more popular than the method of siphonage. With the latter there is often uncertainty whether cessation in the flow is due to absence of more fluid or to blocking of the tube by clot; whereas with aspiration, provided the operation be not hurried, and the patient be made quite comfortable both in mind and in body, the risk of too rapid expansion of the lung, as shown by cough, hæmoptysis, or "albuminous expectoration," is negligible. Care should be taken to see that the local anaesthesia is really effective, and there is much to say for the preliminary use of a sharp scalpel, wherewith to nick the skin, before inserting the needle attached to the aspirator. Trocars with cannulas are to be avoided, and the ritual of a major operation, which is sometimes witnessed, is quite uncalled for.

*How much liquid to remove* depends much upon the individual case. It is very striking sometimes to see fairly rapid absorption started by the removal of quite a small amount. On the other hand, in large effusions, there is nothing to be gained by ceasing the aspiration so long as the liquid flows easily and the patient remains comfortable.

Drugs injected into the pleura after removal of the liquid, at least on the first occasion of its removal, are of dubious value. It is a question whether they do more than satisfy an inherent weakness in human nature to complicate a simple procedure.

The after-care of the patient follows the lines indicated by the knowledge that he is almost certainly tuberculous. Therefore his convalescence must on no account be hurried. Nor must so-called "respiratory gymnastic" be brought into the scheme of treatment too soon—certainly not before the pyrexia has completely ceased, redux friction has disappeared, and any other evidence of active inflammation has subsided. Otherwise there is, once more, the danger of "lighting up" a latent lung focus or of a relapse in the acute pleurisy. A return to ordinary life must not be considered under three months from the time of cessation of symptoms, and it may be necessary to extend this period if the season of the year is unfavourable or the case has been tedious. Even then there should be rules for daily observance, as for an early case of pulmonary tuberculosis.

Rheumatic effusions are almost invariably accompanied by other expressions of rheumatic inflammation, especially by some form of carditis, and their treatment becomes part of the therapy of acute rheumatism. Aspiration is rarely necessary.

Serous effusions in influenza are either associated with active lung disease (pneumonia), when their treatment is determined by this fact and by the degree of illness of the patient; or they appear later as residual collections of fluid when the main illness has subsided, when the question should be carefully considered whether or not the effusion is not really tuberculous. These facts determine their treatment.

In lymphadenoma and in cancer there are no special rules of guidance: the individual case must determine treatment.

## 2. Purulent Effusions and Empyema.

In the main the principles governing the treatment of serous effusions operate here also. But the time factor is of greater urgency, since the old-established surgical maxim to "evacuate pus as soon as it is discovered" should not be departed from in this or in any other condition. The points under consideration, therefore, are concerned more with methods of drainage than with the time of drainage. And these methods have less uniformity in opinion and practice than is the case with serous effusions, because the conditions of satisfactory drainage of a pleural abscess are obtained with less constancy.

The various methods of drainage and subsequent treatment will now be passed in review.

*Treatment by Aspiration, Repeated as Indicated.*—When purulent effusion occurs during the active stage of any disease, and especially when it occurs during the active stage of pneumonia, aspiration is the method of election. Both incision and resection should be postponed, but especially resection. In not a few cases one or two aspirations suffice, and major procedures are found to be unnecessary. Not only is this so in pneumococcal cases, it is sometimes the case in septicæmia with focal pleuro-pulmonary lesions of a suppurative nature, especially when the infection is streptococcal. In influenza cases, again, this procedure should always be given a trial before it is decided to incise the chest or to resect a rib. In staphylococcal pyæmia, on the other hand, although aspiration very occasionally succeeds, and should therefore be tried, drainage by the open method will probably be required sooner or later. Speaking generally, the more ill the patient, and the more certain the evidence of existing pneumonia, the more should the practitioner favour aspiration as against the open method. Too much care cannot be given to this consideration; is the patient ill chiefly as the result of his general infection (with or without pneumonia), or is he ill chiefly as the result of the empyema? Upon the answer to this question depends the decision to aspirate, and perhaps to repeat the aspiration, or to incise with

rib resection. The course of the disease must be carefully watched if we are to arrive at the correct answer. The character of the pus is of less importance as a guide to the method to be adopted than are the above considerations. It is assumed that needles of adequate bore are used, and also of adequate length. It is sometimes difficult to persuade instrument makers that there is use for a needle which is bigger and longer than a hypodermic needle and yet smaller than a trocar.

*Treatment by Simple Incision and Drainage.*—This intermediate method is probably less often indicated, and less often successful, than aspiration on the one hand and resection on the other. But, again, in very ill patients this method may be resorted to with advantage, and especially when the exudate is very thick, and where there are coagula and sloughing pyogenic membrane, as in some pneumococcal cases.

*Treatment by Incision (with or without Rib Resection), Irrigation, and Closure of the Wound.*—This method has had a vogue of late. It is probably only applicable to pneumococcal cases, and, despite some success, it too often transpires that recourse must be had later to the older, and more tedious, methods. Its pursuit appears to be an example of the hope that technique can, some day, triumph over experience.

*Treatment by Incision, Rib Resection, and Drainage.*—This is the old-fashioned method, and still remains the method of election in the majority of cases. Matters of purely surgical technique will not be entered into here. But the level of approach, so as to effect the best drainage, the choice of anæsthetic, and the extent to which digital exploration is undertaken are all of them matters which pay for careful thought. Digital exploration is probably of service in most cases: it enables the observer to glean helpful information in respect of the state of the lung, admits of the breaking down of recently formed adhesions, and facilitates the expulsion of sloughs and coagula. But forbearance should be exercised in all this: "Be bold, be bold.... be not too bold." Modifications in the system of drainage in this, the open method of treatment, deserve further consideration and trial. The desiderata are adequate evacuation of the pus, the avoidance of more than local and temporary pneumothorax, and the least disturbance of the (presumed) diseased lung. The use of a tube which is carefully adapted to the chest wall, and which delivers into an air-tight bottle, is worth more extensive trial. Unfortunately in children, who are the very patients in whom the above-mentioned desiderata are of special importance, apparatus of a complicated pattern are difficult to keep in place.

The question of irrigation of the empyema cavity is one which recurs in the minds and practice of successive generations of practitioners. Whilst admitting that the calamity termed "pleural shock" is a rare event—though probably less rare in pleural lavage than in pleural puncture—it is very doubtful if irrigation as a routine procedure is justified by results. A large number of substances have been used at different times. Dakin's solution (5 per cent. neutral sodium hypochlorite) is supposed to have virtue as a decorticator and solvent as well as a germicide. Aniline dyes, such as methylene blue and gentian violet, have been used a good deal of late. Iodoform emulsion and iodized oil have their advocates. Two things seem clear: irrigation at the time of the operation is always of questionable value, and irrigation at any time, either then or subsequently is to be avoided if there be any suspicion of pulmonary abscess in addition to the empyema.

The importance of treating the patient must never be lost sight of. Indeed, the after-care of the patient should receive special attention. Abundant aërotherapy should be adopted, and, whenever possible, the patient should be in the open air for long periods of the twenty-four hours. The diet should be simple. Sunlight and ultra-violet rays are often helpful. The use of vaccines, though not so popular as they were a decade or two ago, should be considered, and general tonic measures are not to be omitted. In this way is combated any residual infection that may exist, and expansion of the lung is

encouraged. Respiratory gymnastics—deep breathing—may well be employed, and less caution is necessary here than in serous effusions, lest such helps be sought too early.

The problem of the residual sinuses is often a difficult one. The help of x-rays and lipiodol injections is notorious. The indications for treatment when the case has arrived at this point depend upon the application of two principles; that a septic focus in the chest, however small, constitutes a general as well as a local danger; and that there are only two ways in which such a focus can be effectively dealt with—either the lung must be allowed to expand until it reaches the chest wall, or the chest wall must be allowed to fall in until it comes in contact with the lung. Which of these two modes of securing permanent healing is chosen, or whether both are chosen, depends upon the particular case. In the first instance digital exploration with efforts at decortication is the method of election; in the latter, the resection of portions of more ribs. Meantime the methods by which the patient's general tone is re-established must not be relaxed. In such difficulties patience, vigilance and the pursuit of the principles stated usually achieve the end desired.

### Recent Advances in the Treatment of Gonorrhoea.

By Major CHARLES WHITE, O.B.E.,  
and

Major H. G. WINTER, M.C.,

(Abstract from the *Journal of the Royal Army Medical Corps*, Vol. LIII, October, 1929, p. 251.)

THESE writers, for various reasons which they give in detail, prepare a special vaccine in the following manner:—

Large, 6 × 2 inch, tubes of the nucleo-protein medium are inoculated with gonococcal culture and are incubated for twenty-four hours. In order to ensure uniform growth, the same sized tubes, sloped to the same angle, and a standard inoculating loop are used. After twenty-four hours, each tube is washed off with 1.5 cubic centimetres of 2 per cent. saline carbolized with 0.5 per cent. phenol—a separate pipette is used for the addition of the saline and for removal of the emulsion from the tubes, thus ensuring that the stock carbolized saline is not contaminated with gonococcal bodies which might autolyse on standing and release their endotoxin.

The emulsion is put up in vaccine bottles in quantities of twenty-five cubic centimetres. Periodical counts show the average content to be 7,000 106 per cubic centimetres. These bottles are put, with the least possible delay, in a high speed centrifuge giving 9,000 revolutions a minute and are "swung" for about four minutes. After centrifugalization it will be noted that the contents have separated into three layers, a lower greyish layer consisting of the bodies of the gonococci, a middle cream-coloured layer of the *a*-nucleo-protein element of the polar bodies and a clear supernatant fluid which is a saturated solution of the *B*-nucleo-histone in a two per cent. carbolized saline. This clear fluid is pipetted off and put in vaccine bottles ready for use. It is not heated. The solid portions might be removed by sedimentation, but high-speed centrifugalization is resorted to because it has been found that the shorter the period the diluting fluid is left in contact with the organism, the less likely to autolysis to take place. Vaccine prepared in this manner will keep well for considerable periods and under varying conditions of temperature, still retaining its antigenic power. The dosage is two cubic centimetres and the optimum interval between doses is six days.

The method of administration is of some interest. We believe that body immunity depends largely on the stimulation of the lymphatic system and that, if a vaccine be given subcutaneously, intramuscularly or intravenously, a large proportion will be excreted before it has been able to exert its antigenic power. Moreover there is a definite danger of thrombosis when saturated solutions of nucleo-proteins are introduced into the blood-stream direct.

For these reasons the vaccines are given intradermally. A dose of two cubic centimetres is, however, too big to administer by this route in one site, it is, therefore, distributed over seven areas as follows: inner and outer wall of the axilla on each side, inner side of both thighs and into the skin at the base of the penis. Provided a fine, sharp needle is used no difficulty is experienced and very little pain felt. The results of the vaccine are a slight local reaction and enlargement of lymphatic glands.

The authors summarize their method of treatment as follows:—

On admission to hospital a smear is taken and if positive the following procedure is carried out:—

(1) Half an ounce alkaline sodium phosphate is given four times a day.

(2) Two posterior irrigations a day are given with 1|20000 pot. permang.

(3) Two cubic centimetres polar body vaccine are injected intradermally in seven places. This is repeated every seventh day for as long as required.

(4) Daily smears are examined and the approximate number of pus and endothelial cells and gonococci are estimated (the numbers are recorded as approximately the number per field, i.e., "G. C. 2|1, P. 4|1, E. P. 1|10").

(5) A rough estimate of the urinary pH is made daily.

(6) The patient is kept "up" on ordinary diet with the addition of vegetable soup twice daily and four pints of barley water (made without lemons).

(7) Two and three times weekly the patients are assembled in the treatment room and their urine examined by the two-glass method. It has been found that, in view of the large amount of phosphate present, glacial acetic acid is frequently required to clear it. It is not suggested that the two-glass method is infallible but, if one method is adhered to, after some experience a good deal of information can be obtained.

(8) Immediately the discharge begins to lessen, irrigations are cut down to one a day and later discontinued. Patients are put on light fatigues at the earliest possible moment.

(9) When a patient has been "dry" for seven consecutive days on no treatment and no light fatigues, he is examined with the urethroscope or straight sound and by prostatic massage. If no evidence of disease is discovered he is discharged from hospital to duty but is kept under observation for six weeks to two months, reporting at first weekly, later fortnightly.

(10) If, during the course of treatment, complications, such as acute posterior urethritis, develop, the patient is put to bed on a low diet with the appropriate treatment. Irrigations are stopped but the vaccine is continued. In fact the treatment of complications is the same as heretofore with the addition of vaccines and sodium phosphate.

### Chronic Appendicitis as a Cause of Indigestion.

By M. O. BURKE, M.D.

(Abstract from *Southern Medicine and Surgery*, Vol. 91, No. 6, June 1929, p. 391.)

THERE is a doubt in the minds of many physicians as to the existence of chronic appendicitis; they have some strong evidence in their favour.

Drs. Carnett and Boles, of Philadelphia, presented a paper at the A. M. A. meeting in Minneapolis (1928) entitled: "Fallacies Concerning Chronic Appendicitis." They make this statement: "A clinical diagnosis of chronic appendicitis implies that the patient has a localized disease confined to the appendix, that appendicectomy is indicated, and that the operation will provide a cure. We believe that chronic appendicitis is not a disease limited to the appendix."

Taking these statements literally we cannot confute them. Some claim that operation for chronic appendicitis does not relieve the digestive symptoms. We know that many cases, both acute and chronic, have had

appendicectomies without benefit; some have been made worse. We also know that many patients have died because they did not have an operation soon enough. It is evident that many appendices have been accused, convicted and executed that were entirely innocent. We are probably prone to convict the appendix when we can't find some other definite cause of the trouble. Discomfort and tenderness in the lower right quadrant does not always indicate appendicitis, nor does tenderness and pain over the same area necessarily mean intercostal neuralgia, as described by Drs. Carnett and Boles.

Is it possible that all of the textbooks are wrong in describing chronic appendicitis? Are the experiences of such physicians as Aaron, Einhorn, Friedenwald, Rehfuß, Smithies and the world-famed Osler worth nothing? Shall we discard the reports of our best radiologists and count as fallacies the experiences of our leading surgeons?

At the twenty-sixth annual meeting of the American Radiological Society, Dr. A. L. Gray reported a series of cases of chronic appendicitis as a cause of acidosis in children, diagnosed as chronic appendicitis, operated on and cured. Deaver and Rodwin report 500 cases of chronic appendicitis with operation: 83.1 per cent. entirely relieved, 9.7 per cent. partially relieved.

Believing that chronic appendicitis is a cause of indigestion has led me to write this paper. Trouble manifested by the stomach is more often extragastric than intragastric.

The following are replies from some of our outstanding gastro-enterologists as to the percentage of cases of indigestion caused by chronic appendicitis: Aaron 10 per cent., Einhorn 2.5 per cent., Friedenwald 10 per cent., Smithies 7 per cent.

In going over my own case histories I find about 10 per cent. of cases of indigestion diagnosed as due to chronic appendicitis: 50 per cent. of these were diagnosed, operated and cured; 50 per cent. diagnosed, not operated, benefited by treatment, but not cured.

#### CLASSIFICATION.

Royster's classification of chronic appendicitis:

1. Catarrhal.
2. Interstitial.
3. Obliterating.

The types of chronic appendicitis that cause indigestion may be classified as:—

1. Recurrent mild appendicitis.
2. Partial occlusion of any portion of the appendicular canal.
3. Appendices with adhesions.

In some instances of appendicular adhesions the appendix was not the offending party; it was caught in bad company. The appendix may be attached to any of the inhabitants of the abdominal cavity. I have seen it attached to the stomach, producing symptoms of a gastric ulcer and have seen it imbedded in a mass of omentum held fast in the femoral ring. We can readily conceive of trouble when the appendix, an organ two to five inches long, has one end fastened to the cæcum and the other end tied to something several feet longer than itself. Natural peristalsis of the intestines would cause tension on the appendix and extensive peristalsis would cause greater tension; thus producing irritation in the appendix and in the organ to which it is attached.

A narrowing of the lumen of the appendicular canal may permit the entrance of material from the cæcum but may retard or obstruct its exit; as a consequence, decomposition, fermentation and formation of toxins take place, causing irritation, possibly ulceration and absorption of poisons.

Recurrent appendicitis may be of the catarrhal, interstitial or adhesive type, or it may combine all three types. The attacks may be frequent or far apart. The symptoms may be irritative or mildly toxic. The gastro-intestinal tract is supplied by the vagus nerve, the nerves from the sacral portion of the spinal cord, the sympathetics and the plexuses of Auerbach and Meissner, also Keith's nodes. The vagus extends to the descending colon. The same portion of the gastro-intestinal tract receives its sympathetic nerve supply from the superior

mesenteric ganglion. "The muscular and glandular structures are activated by the parasympathetics and receive inhibitory impulses from the sympathetic."

"An equilibrium of action is maintained when the excitability of the parasympathetics and sympathetics equal each others, or when the excessive excitability in the one is still short of overcoming the excitability of the other."

Chronic appendicitis may produce chemical, mechanical or toxic irritation. From the symptoms produced by traction on an adherent appendix we are led to believe that mechanical irritation stimulates the parasympathetic nerve supply. The symptoms of a recurrent attack of appendicitis bear out the statement by Pottenger that "toxins stimulate the sympathetic nerves."

The symptoms produced by chronic appendicitis are reflex symptoms, except the tenderness of the appendix or an inflamed viscus to which it is attached; this accounts for the difficulty in making a diagnosis—and enables us to understand why chronic appendicitis causes indigestion. Irritation in the appendix is most frequently reflected to the stomach and duodenum, if the impulse is transmitted by the vagus it may cause cardiospasm or pylorospasm, hypersecretion and increased peristalsis; manifested by pain, a sense of fullness and sour stomach. Next in frequency the terminal ileum, cæcum, ascending and transverse colon are affected.

If the circular muscles receive the greater impulse we may have contraction and increased secretion with a dilated condition and delayed contents above the constriction; producing stasis, decomposition and fomentation; manifested by fullness, pain or discomfort and constipation; or if the longitudinal muscles receive the greater impulse we may have increased peristalsis and secretion; manifested by diarrhoea and mushy stools.

If the sympathetics are stimulated more than the parasympathetics we may have stasis of the main viscera with contraction of the sphincters, decreased secretion and increased absorption; manifested by slight rise in temperature, headache, lassitude, irritability, weakness, constipation, a dead heavy feeling in the abdomen with or without distention and a general miserable condition. The symptoms may be constant companions, frequent visitors, or occasional unwelcome guests. They may be very mild in type or of considerable vigor. Ordinary diet and exercise have but little effect in relieving or causing the symptoms, while imprudence in either may bring on an attack.

The symptoms can be briefly stated as colicky pains, acid stomach, gaseous distention, constipation, headache, lassitude, irritability, nervousness, general weakness, despondency, and more or less rigidity of the muscles in the lower right quadrant.

#### DIAGNOSIS.

Remembering the fact that indigestion is more often a symptom of trouble outside than inside the digestive tract makes us more careful in searching for the cause. A full history past and present is essential. A thorough examination of the patient is imperative. The abdominal examination should be last and exhaustive. Auscultation ascertains the rate and rhythm of peristalsis. Percussion demonstrates the presence or absence of solid or liquid masses and the extent of tympany: by the different notes we can usually outline the stomach, intestines and colon. Palpation is a most valuable ally in diagnosing abdominal trouble; by it we recognize rigidity in the abdominal muscles, in thin abdomens we can often feel the constricting spasms in the intestines and the distended portion above them. We can feel the violent peristaltic waves passing under the hand; we can bring out the tender point by pressure; we can feel and often empty a stagnant cæcum.

X-ray examination in chronic indigestion is most valuable and for a correct diagnosis often indispensable.

The points upon which I rely most in making a diagnosis of chronic appendicitis as a cause of indigestion are these:—

1. A history of an attack of colic or pain in the lower right quadrant, diagnosed or undiagnosed as appendicitis.



2. Reflex types of indigestion.
3. A palpable tender cæcum with some rigidity of oblique, transverse and psoas muscles in lower right quadrant.
4. Recurrent attacks of so-called biliousness in adults and acidosis in children, with a tender palpable cæcum.
5. The above symptoms, plus x-ray confirmation and diagnostic exclusion of everything else that could reasonably cause the trouble.

A positive diagnosis of chronic appendicitis is the most difficult task undertaken by the physician or surgeon.

#### TREATMENT.

The only cure for appendicitis is surgical but surgery is not always advisable. We must remember that the nerves involved in indigestion caused by any chronic condition are sensitive for a long time after the cause has been removed. If we are reasonably certain that the appendix is the offender in a child by all means remove it. There are many brilliant examples of success in appendicectomies for chronic indigestion in children, some in adults and even in old people. Complications, the general condition of the patient and the type of patient often make us hesitate to advise an operation.

Regulation of diet, exercise and general advice as to living will often guide the chronic appendicular bark through the troubled waters of a long journey to a safe haven from which some other malady will finally collect the ticket for eternity.

### An Address on Recent Aids in the Diagnosis of Some Common Disorders.

By T. C. HUNT, B.M. (Oxf.), M.R.C.P. (Lond.).

(Abstract from *The Lancet*, October 12th, 1929, Vol. CCXVII, p. 751.)

#### INDIGESTION.

I SHOULD like to say a few words about the differential diagnosis of some of the causes of indigestion, with particular regard to the so-called functional dyspepsias. The common type of patient, most usually a woman, who has abdominal symptoms suggestive of perhaps a gastric ulcer, but in whom we feel confident that a "neurosis" is the true cause, may present great difficulty in diagnosis. Often enough the general behaviour of the patient is characteristic and the pain is usually one that gets worse on going to bed, but never wakes her up once she has got to sleep; it is probably fairly true that "a neurosis never woke a patient." At the same time we often wish for physical signs or laboratory tests that can confirm our suspicions and exclude organic disease.

Of the physical signs of neurosis there is no one alone that can be of genuine assistance, and even a combination of many together can only increase the probability of a functional condition. Of these signs I may mention the exaggerated deep reflexes, brisk abdominals, absent palate reflex, and the evidences of various stigmata of degeneration such as asymmetries and minor deformities. To these is often added a condition of excessive vasomotor irritability or dermatographia, in which a wide red mark rapidly appears after quite gently stroking the skin with a blunt instrument. There is frequently a tachycardia and a low blood pressure which reacts abnormally to mild exertion. A further sign which is not commonly present in persons of "non-neurotic nature" is an absence of the corneal reflex, which is perhaps the most suggestive of all the multitudinous signs of "neurasthenia" that have been proposed.

All these signs, however, are notoriously unreliable and laboratory aids in investigating the case are of real importance. Of these I would especially mention the

value of an examination of the stools for *occult blood*, the finding of which definitely excludes a functional condition. It is so readily detectable that it should be looked for in all cases in which the possibility of ulcer or growth arises. In peptic ulcer intermittent bleeding is very common and in carcinoma of the stomach occult blood is seldom absent and often continuous.

The test is very easily carried out, and the patient need only exclude meat (and meat-extracts such as soup), fish, and green vegetables for two days from his diet. The simplest and most reliable technique is that of Gregerson, with the aid of benzidin tablets (benzidin 0.025 g. and barium peroxide 0.2 g.) obtainable from any chemist. One tablet or powder is dissolved in 5 to 10 c.cm. of strong acetic acid (50 per cent.), and a small particle of stool is rubbed up on the end of a match with a few drops of this solution. A positive result is shown by a green to deep blue colour appearing at once or within one to two minutes.

The use of these powders not only simplifies the test considerably, but excludes some of the fallacies of other methods of detecting occult blood. Indeed, A. G. Ogilvie considers that a blue colour obtained within 30 seconds is proof of occult blood in the stools entirely irrespective of the patient's previous diet. I realize that the test is well known, but I think it deserves more frequent application in general practice.

*Test-meal analyses* are, I am afraid, seldom of great assistance except in carcinoma of the stomach, pernicious anaemia, and duodenal ulcer. In the reflex and toxic dyspepsias of pulmonary tuberculosis, gall-bladder disease, renal disease, or chronic appendicitis, for example, the variations in gastric secretions are so diversely reported that assessment of their true significance is extremely difficult. In functional dyspepsia all types of test-meal results may be obtained.

There is one further test, which is old in origin but recent in its general utilization, which may be employed with advantage in such cases—namely, the *red cell sedimentation test*. In spite of all that has been written and claimed for this test, especially in relation to pulmonary tuberculosis, the evidence of recent years shows that its real and great practical value lies simply in the differentiation of organic disease from functional disorder. It is in no way specific for any one form of disease, although exaggerated claims have often been made in this respect. It is a test that determines merely the rate at which the red cells fall to the bottom in citrated blood, and even now, in spite of the immense amount of work that has been done upon it, we do not know the exact factors that control this rate of sedimentation. Four volumes of blood are mixed with one volume of 3.8 per cent. sodium citrate and the rate of sinking of the red cells in this dilution is normally slow. I will not describe the exact details of the test, the results of which are recorded either in terms of the time taken for the cells to reach a given height in a standard tube (Westergren-Fahraeus) or of the height reached at a given interval of time (Linzenmeier).

In organic disease, especially where any form of tissue destruction is occurring, the rate of sedimentation is considerably increased. It has now been completely demonstrated that in a given case rapid sinking of the red cells above the normal rate excludes the diagnosis of a purely functional disorder.\* A normal rate is unfortunately by no means such certain evidence of the *absence* of organic disease. In suspected gastric neurosis or other functional disorders, therefore, a normal sedimentation rate is confirmatory only of the diagnosis, whilst on the other hand a rapid sedimentation must make us immediately turn to an organic cause for the symptoms concerned. In this somewhat limited field of usefulness this simple and inexpensive test has, I think, a definite value. The details may be found in any recent textbook.

\*A rapid sedimentation is normal during the early months of pregnancy.



## The Microscopic Examination of Fæces for Bacteria.

By S. W. PATTERSON, M.D., D.Sc., M.R.C.P.

(Abstracted from *The Lancet*, October 12th, 1929, Vol. CCXVII, p. 785.)

THE conditions of warmth, moisture, and pabulum obtaining in the intestinal tract are almost ideal for promoting the growth of micro-organisms, and a great variety of bacteria is to be found in the fæces. They are, however, really outside the body itself, and are to be regarded as essentially saprophytes, although under certain circumstances almost any of them may enter the body and become pathogenic. There are four great groups of bacteria normally appearing in the fæces; the coliform bacilli, the streptococci, the anaerobes, and the acidophile bacilli. The streptococci and acidophiles retain Gram's stain as do most of the anaerobes, while the coliform bacilli are decolorised by Gram's method. A generation ago Combe advocated the simple staining of a smear of the fæces by Gram's method, and drew inferences from the proportion of bacteria which retained the violet coloration to those which were decolorised and took up a counter stain. Although this procedure has not led to results of practical application, a variation in the proportion of the bacteria of the four groups named does nevertheless occur, and one of the chief factors influencing this variation is the diet taken by the patient.

### INFLUENCE OF DIET.

The intestinal tract, which is sterile at birth, is soon found to contain bacteria. Normally about one-third of the dried fæces of healthy people on a mixed diet consists of bacteria. During the period of milk-feeding, the acidophile group predominates largely; but with the onset of mixed feeding, the bacterial distribution changes and soon resembles that of the adult, the coliform bacilli becoming the prominent group. The coliform and anaerobic bacilli preponderate with a high protein diet; whilst the *B. acidophilus* is increased on a high carbohydrate diet. Increase of streptococci follows an addition of glucose or cane sugar to the diet, and the numbers of viable streptococci are greater after a saline purge. Elimination of many putrefactive anaerobic bacilli and other proteolytic organisms, and reduction of the coliform bacilli, can be brought about by a lacto-vegetarian diet, with plenty of fruit and green vegetables, especially if lactose be added. Cultures of *B. acidophilus* may be given in milk to hasten the change of flora.

In addition to the normal inhabitants of the bowel, certain pathogenic organisms occur in disease, such as typhoid, dysentery, and tubercle bacilli. These will be dealt with before discussing the conditions under which the normal bacteria may cause disease.

### THE TYPHOID-PARATYPHOID GROUP.

In the typhoid-paratyphoid group of diseases the bacteria may appear in the stools from the first week onwards, and are recovered in one-third to one-half of the cases. Though other methods of diagnosis are more reliable—such as blood cultures during the first ten days, and the Widal reaction after that—culture of the stools is useful as a control. Bacteriological technique has much improved as the result of the experiences of the war; it is now agreed that before a positive finding is reported the suspected organisms must not only conform to requirements in motility and fermentation of sugars, but also must be agglutinable by a standard serum. Typhoid and paratyphoid B bacilli, though less common than formerly, occur still in mild epidemics; paratyphoid A, an Eastern type, was more often met with during the war, brought by the troops coming from India. These diseases must be notified. The bacilli continue to be excreted in gushes for some time during convalescence, so that several negative reports at intervals should be obtained before the patient returns to ordinary life. Sometimes it happens that a patient, though apparently well, con-

tinues to pass enteric bacilli at intervals; he becomes a "carrier," and a source of unwitting infection of the rest of the community. Such a person should be isolated under medical supervision, and should be debarred from any occupation which entails the handling or distribution of foodstuffs. Unfortunately, in these cases, it is often difficult to get rid of the infection, which may continue for a long time in such places as the gall-bladder.

### DYSENTERY BACILLI.

In cases of colitis due to infection with dysentery bacilli, the organisms can be recovered from the mucus-pus in a large majority of the cases in the acute stages; in chronic cases they are rarely found. Indeed it may well be that bacillary dysentery is always an acute infection, though sometimes quite a mild one; and that a chronic colitis following an attack of dysentery is kept up by non-specific bacteria as a secondary infection. The laboratory report should differentiate between dysentery bacilli of the *Shiga-Kruse* and of the *Flexner-Y* types. The former infection is a serious affair, since the *Shiga* bacillus has a toxic effect on the nervous system as well as on the intestine. Nowadays a good antitoxic serum is available. Infection with *Flexner* dysentery bacilli is milder; it may be troublesome, however, and even fatal in infants, or in elderly or debilitated patients. There are at least five members of this *Flexner-Y-Hiss* and *Russel* type, and no standard serum is available. Eliminative treatment, for example by sodium sulphate, is the best.

A number of bacilli, not true dysentery, but capable of producing colitis, are grouped together as *paradysentery* bacilli, of which perhaps the best known are *Morgan's No. 1* bacillus in the summer diarrhoea of children, the *Sonne* bacillus associated with dysenteric symptoms, and the *Bacillus enteritidis* of *Gaermer* and *B. artrycke* in food poisoning. The allied *B. suispestifer* (hog cholera bacillus) is important for animals and probably sometimes for man. There are also others whose claim to be regarded as pathogenic is not yet accepted. These will be dealt with later.

### TUBERCLE BACILLI.

A report of tubercle bacilli can only rarely be unexpected. Their presence in sufficient numbers to be detected in a routine examination will occur only when there is gross clinical evidence of chronic bowel trouble. In children with phthisis, in whom all sputum is swallowed so that none is available for direct examination, pus containing tubercle bacilli may be passed in the motions. In suspected cases of intestinal tuberculosis, special methods of concentration with anti-formin and inoculation of a guinea-pig may be required.

### Cocci.

*Staphylococci* are not inhabitants of the intestine. When their presence is reported, a local infection of the lower bowel by abscess or fistula-in-ano should be sought for; otherwise it is a negligible contamination from the skin. *Streptococci*, on the other hand, form one of the important groups of the normal intestinal flora, and there are several varieties which may at times be pathogenic. The usual differentiation made is by their action on blood cells, so that they may be classified according as they produce a green pigment, or completely hæmolyse the blood corpuscles, or have no effect upon them. All three classes may be present in fæces. The non-hæmolytic one (*enterococcus*) is the commonest. It is usually not pathogenic, though it is reputed to be so at times, as a secondary infection following ulcerative states of the bowel. A variety of the *enterococcus* is believed by *Bargen* to be the causative organism in chronic ulcerative colitis; but this is not generally accepted by pathologists. The other two classes, green and hæmolytic streptococci, may also become pathogenic. If they invade the blood stream or tissues of the body, they may cause severe symptoms, but their presence in the fæces is not necessarily significant.

## OTHER MICRO-ORGANISMS.

The vibrio of *cholera* may be found in epidemics in the tropics, but does not occur in these islands. *B. pyocyaneus* (the bacillus of blue pus), *B. proteus* (a putrefactive bacillus often found in great numbers in watery offensive stools), *B. lactis aerogenes* (allied to *B. Friedlander*, the pneumobacillus), *B. faecalis alkaligenes* and *B. pseudoasiaticus* are rather harmless findings in the faeces, though possibly they may become pathogenic at times in other situations.

The other groups of faecal bacteria, anaerobic and acidophile, as well as the spirochaetes and yeasts—except the ray fungus of actinomycosis—are not important so long as they remain in the lumen of the bowel; though it may be expected that as our knowledge of the biochemical products formed by these organisms from food-stuffs increases, there will be some evidence found on which to form conclusions about a possible "intestinal toxæmia."

While one-third of the dried weight of normal faeces consists of the bodies of dead bacteria, these bacteria in the lumen of the bowel are really, as already mentioned, outside the limits of the body proper, and are as unlikely to gain entrance to the body, unless there is a breach in the mucous membrane, as are skin organisms without some damage to the skin epithelium. Such a break in the mucous membrane of the bowel occurs in any abrasion or ulcer, and there is no doubt that a secondary infection of dysenteric and tuberculous ulcers takes place with the ordinary cocci and bacteria of the bowel. Even when the site of invasion is not obvious, we know that a septicæmia with colon bacilli may occur, and that these are often excreted by the kidney causing irritation and inflammation of the urinary tract. Just before death, too, the blood is often invaded by bowel organisms, which can be recovered in blood culture; being a terminal state only, this septicæmia of intestinal organisms is not important, as by the time it sets in the bowel wall has probably lost its normal protective power.

## CRITERIA OF PATHOGENICITY.

These conditions are, however, exceptional. What importance should be assigned to the bacteria which remain in the lumen of the bowel? It must be noted that the media used for culture of micro-organisms are artificial ones; though selective for some bacteria, they may even inhibit others. The amount of growth on culture media may bear little relation to the numbers of bacteria present in the faeces, or to their pathogenicity. Too much emphasis should not be laid on an apparent increase in numbers, such as an excess of streptococci; it has been shown above that great variations in numbers of streptococci occur with change of diet, and of the consistency of the stools. In pernicious anemia and other conditions with sub-acidity of the gastric juice, there is a great numerical increase of the normal inhabitants of the bowel, *B. coli*, streptococci and especially the anaerobe *B. welchi*. But there is no evidence that these organisms differ qualitatively from those found in healthy persons, or that any individual type of organism is specifically related to pernicious anemia. It is necessary, too, to avoid the fallacy of treating the patient for such conditions as the presence of coliform bacilli, which are atypical in having a delayed power of fermenting lactose. The usual *B. coli* rapidly produce acid and gas in lactose media, whilst most of the known pathogenic Gram-negative bacteria do not show this reaction with lactose in ordinary media. There is an intermediate group which ferments lactose after an interval of several days some of them may even produce so much ammonia from peptone digestion that an acid reaction never appears which are classed alternatively as *para-dysenteric* or *para-colon* bacilli. A few of these are of known pathogenicity, a few of known harmlessness; there is little evidence that the majority of them exert a harmful action on the animal body. The quality of delayed fermentation of lactose is not therefore significant. A further group of these colon bacilli is

found to grow in the presence of normal active serum; some even hæmolyse red blood corpuscles. These serum-resistant and hæmolytic *B. coli* may be pathogenic, but we have no certain evidence on this point. The same is true of hæmolytic streptococci. Their ability to live on blood, digesting and destroying the red corpuscles, makes them, at any rate, potential parasites, and, if they are found elsewhere in the alimentary tract at the roots of teeth, in the crypts of tonsils, or in the discharge from nasal sinus infection, as well as in the faeces—their possible importance cannot be denied. But if the evidence we have of the pathogenicity of these groups of bacteria is doubtful, evidence of their relevance in a particular patient is usually unattainable; the presence of any sort of specific immune body in the patient cannot be demonstrated by serological tests.

## VACCINES FROM FÆCES.

The value in treatment of vaccines made from the faeces, though widely assumed in this country, is not proved by bacteriological criteria, and does not rest on the same scientific basis as, for example, typhoid preventive inoculation, or the treatment of diphtheria and tetanus with serum. Nor has it the support of solid clinical proof, such as that of the value of vaccination against smallpox. It rests mainly on clinical impressions, which, as time goes on, may need to be revised, or, at the least, defined and classified.

In view of the great difficulties which confront anyone attempting to assess the possible pathogenic significance of faecal organisms, therefore, no clear indications can be found for their use in vaccine-therapy. Antibodies to them may be formed by a patient into whom they are injected, but we have no means of knowing whether these have any specific action or are likely to help the patient in resisting his disease. Although vaccines have a proved place in bringing about protection against subsequent infection, their role in treatment is by no means securely founded. Until further positive evidence is accumulated, therefore, we have no warrant for using any but those derived from organisms with known pathogenic action; the promiscuous use of vaccines from other faecal organisms is unlikely to lead to useful results.

## The Relation of Ear Conditions to Bathing.

By W. I. DAGGETT, M.A., M.B., F.R.C.S.,  
and

R. COVE-SMITH, M.A., M.B., M.R.C.P.

(Abstracted from *The British Med. Journ.*, August 17th, 1929. No. 3580, p. 296.)

THE daily papers are taking an increasing interest in the health of the populace, yet insufficient attention has been drawn to the precautions necessary for those who wish to avoid the inconveniences which may result from careless indulgence in swimming. Many medical men allow their patients too much licence in this direction, and fail to pay attention to small details which would increase the comfort of all.

It is obvious to those who attend out-patients in any large ear, nose, and throat clinic that a great number of acute aural conditions develop as the result of bathing. Moreover, such conditions may have dangerous sequels. For a long time at King's College Hospital we have had a notice placed in the out-patients' department which warns patients against bathing without leave from the surgeon.

From the point of view of the ear, nose, and throat surgeon the bathing community can be divided into (1) healthy persons; (2) those with septic nasal conditions (including the common cold); (3) those with a perforation of the tympanic membrane; (4) those with recurrent dermatitis or furunculosis of the external auditory meatus.

As regards persons in normal health, the public has a vague idea that water introduced into the meatus may be dangerous, and cotton-wool and other substances are used to prevent this. In such persons the

entry of water does no harm, though it may give rise to several unpleasant symptoms. Among these are deafness and tinnitus following immersion. This is due to the swelling of wax and occlusion of the meatus, or to water collecting behind an accumulation of wax where it may remain for some time. Another cause is the foolish practice of drying the ears with the rolled-up corner of a towel, thus pressing down against the drum any wax that may be in the meatus. Some may complain of a transitory carache due to cold water impinging on the drum, but this symptom should not be "passed off" without thorough examination lest acute otitis media be the cause. We have not yet met a case of vertigo; in fact, this is hardly to be expected, as cold water enters each meatus with equal caloric stimulus to both labyrinths, so that the labyrinthine equilibrium remains undisturbed. The possibility of the occurrence of such a symptom must, however, not be overlooked, for it could occur if one meatus was occluded and the other patent.

Too often acute otitis media, with or without dangerous complications, occurs in the healthy swimmer. This is due to the entrance of infected water into the Eustachian tube and middle-ear tract. Public swimming baths and "town" rivers are great sources of danger. Those who bathe in the sea or in mountain streams are usually exempt from trouble. The healthy Englishman is fond of swimming, and in the large towns public baths afford the only facility. There is therefore a crying need for those in authority to render the public baths as safe as possible. It is essential that constant inspections should be undertaken. The problem is a difficult one, for disinfectants cannot be introduced in sufficient concentration without rendering bathing irksome. Calcium chloride is used in many places; it imparts a somewhat unpleasant taste to the water, and usually gives rise to a mild conjunctivitis. Naturally water is not rendered safe by this means, but if continuous filtration is carried out as well the risk is minimized. It is interesting to note that we have not been able to trace more than an isolated case of ear trouble attributable to bathing in the Camberwell baths, where this method is practised. In far too great a proportion of public baths the water is not changed often enough, whilst scouring of the empty bath is inefficiently carried out. It should be made compulsory for bathers to wash with soap before entering; in Germany this is an almost universal practice. Again, it is a bad principle that bathers should be allowed to come in straight from the streets and tramp along the sides of the bath in their grimed boots. All this filth must sooner or later find its way into the water.

The present facilities for bathing will not be revolutionized for some time, so we must consider what type of swimmer tends to develop acute otitis media and how the risk may be minimized. As a rule it is the badly taught, inexperienced swimmer who suffers most and becomes the victim of an "acute ear." Correct breathing is essential to prevent the entry of infected water into the Eustachian tubes, and it is here that the tyro fails. The practised swimmer fills his lungs at regular intervals through the widely opened mouth, keeping the soft palate raised and thus shutting off the nasopharynx. In fact, many swimmers of repute continually have the mouth open, even under water, gradually blowing air out until they need a fresh inspiration, when the head is turned clear of the water and air taken in through the mouth. The inexperienced swimmer fails to regulate his breathing properly, draws the water into his nose, chokes, and swallows; this last action opens up the Eustachian tubes and water is allowed to enter. For the same reason it is unwise to "duck" suddenly or to push a friend in unawares; proper inspiration is difficult in such crises. Jumping in from a high board should not be practised without holding the nose, as the sudden inrush of water into the nostrils may force some into the sinuses or into the Eustachian tubes.

It will be argued that thousands of people in normal health bathe regularly without precautions and come to

no harm; nevertheless, the risk is there, and correct breathing should be taught.

The second class, those suffering from septic nasal conditions (including the common cold), should not be allowed in public baths. Not only do they spread infection, but any water entering the nose may carry infection backwards into the nasal accessory sinuses or Eustachian tubes. Swimming is dangerous in the same way as the pernicious habit of sniffing salt and water up the nose to relieve the common cold.

Patients who have a perforated tympanic membrane often ask whether bathing is permissible. Whether or not there is discharge the answer should be an emphatic "No." Those in whom the discharge has ceased will almost certainly become reinfected with consequent exacerbation of old trouble; whereas those with an active discharge will contaminate the water and lay themselves open to the risk of added virulent infection and acute symptoms supervening on the chronic. The professional or expert swimmer may possibly be excepted if the ear has been dry for two years or more, although the perforation has not healed, but every precaution must be taken as regards breathing and against the entry of water into the meatus. No form of precaution is "foolproof," though a small piece of wool impregnated with vaseline and laid in the meatus may serve a useful purpose. Better still, a thin piece of wool may be laid over this and kept in place with collodion. A successful radical operation, one year after complete healing, places the patient in Class 1 (healthy persons) as regards bathing. Patients with acute or chronic meatal eczema or recurrent attacks of meatal furunculosis are best advised not to bathe, for exacerbations are only too common.

Many swimmers who make a practice of diving into deep water complain that when they go beyond a certain depth they get a violent ringing in the ears. This is as a rule temporary; it is partially due to prolonged holding of the breath and partially to increased pressure on the tympanic membrane and stapes. Should it persist it will probably be found that there is some degree of Eustachian obstruction and retraction of the tympanic membrane and that politizerization will relieve the noises.

## Reviews.

**RECENT ADVANCES IN CARDIOLOGY.**—By C. F. Terence East, M.A., M.D. (Oxon.), F.R.C.S. (Lond.), and C. W. C. Bain, M.C., M.B. (Oxon.), M.R.C.P. (Lond.). London: J. A. Churchill 1929. Pp. VIII plus 342 with 12 plates and 57 text figures. Price, 12s. 6d. net.

THERE can be no doubt that the *Recent Advances* series of medical books has obtained a degree of popularity which it deserves.

The science of cardiology has advanced with immense strides during the last decade. This advance has been due to the previous work, experimental and clinical, that was carried out by the famous pioneers of modern cardiological methods. The heart specialist of to-day has means of investigation that were unknown to his teachers. Not only can he use these methods when necessity arises, but, what is more important, his clinical acumen and personal experience are now based on facts that have been proved to be correct by scientific means and experiments.

He is no longer working in the dark, nor is he attempting to judge the efficiency of the heart only by the deceptive sounds that he hears with a stethoscope and the very variable symptoms that are associated with such an investigation.

It is an explanation of these modern methods that this book describes, and we may say at once describes with the greatest success. The first two chapters deal with myocardial infarction and angina pectoris. The differentiation of these important diseases is clear and all recent knowledge of the symptoms of thrombosis of the coronary arteries is included.

A chapter entitled, "Some evidences of Myocardial Disease," is very practical and the value of the electrocardiograph is explained. Disorders of rhythm are adequately described. A considerable portion of the book deals with circulatory failure in all its aspects. This is extremely interesting and embodies all the recent knowledge that has accrued from physiological experiments and clinical observations. The chapter on the treatment of heart failure is practical and sufficient. The condition of the heart under abnormal conditions such as infections, anaesthesia and thyroid disorders and pregnancy is considered, and the methods which may be expected to help the heart under these circumstances are described. The action of digitalis on the heart receives a chapter to itself and is as clear as any that the reviewer has seen on this rather complicated subject. The modern methods of cardiac radiography are explained and the principles of electrocardiographic examination are summarised. Abnormal blood-pressure and its significance receives rather scanty treatment in the final chapter.

There is no other book of this size which explains the present position of cardiology so simply and adequately. As with all the others of this series the printing, index and bibliographies leave nothing to be desired.

This volume should be in the possession of all medical men, and perhaps those who received their medical education more than ten years ago will find it of the most value.

H. H.

**HAEMODYNAMICS: THE MECHANISM OF VENOUS CAPILLARY AND LYMPHATIC FLOW: OEDEMA; AND INJECTION TREATMENT OF VARICOSE VEINS.**—By P. B. Kittel, F.R.C.S. London: H. K. Lewis and Co Ltd. 1929. Pp. XI plus 195 with 3 plates and other illustrations. Price, 10s. net.

THE title and subtitle of the book are sufficiently explicit as to the nature and scope of Dr. Kittel's treatment of the subject. The first two chapters form an introductory section in which the physical signs of varicose veins, the action of valves in veins and compensatory dilatation are lucidly sketched.

Varicose eczema and ulcers are known according to the author's observation to be confined to the lower limbs and "in about 80 cases out of 450 at the hospital, which have had skin lesions of one sort or another peculiar to varicose veins, the highest point where eczema has been found has been the tubercle of the tibia, and an ulcer has not been observed much higher than about the middle of the shin."

When the lesions (which are inferred to be part of a condition in which varicosity is the commonest feature) are joined up through proximity and development the whole skin is seen to be destroyed, though initially they are localized as eczemas and confined to the obstruction of only epidermal cells.

Another digression upon venous and capillary flow discusses the relevant points of blood circulation for the proper comprehension of the subsequent chapter on oedema and lymphatic oedema.

The last part of the book deals with modern researches on the flow in varicose veins and of the experiments of the author in the treatment of this condition, and of varicose eczemas and ulcers, with the results obtained by the action of various drugs in these cases.

A great amount of original matter from the author's researches is incorporated in the volume.

All interested in the pathological condition of venous and lymphatic stasis will find this illuminating contribution a most helpful addition to the literature.

S. S. R.

**A NEW TREATMENT OF TUBERCULOSIS.**—By P. Hulliger. London: H. K. Lewis and Co. Ltd. Pp. X plus 146. Illustrated by 40 photographic and radiographic plates showing cures of cases of tuberculosis of the lungs and bones. Price, 8s. 6d. net.

The author claims that his treatment, as opposed to all other treatments for tuberculosis, is specific. This claim he bases upon the reaction-producing pro-

perties of his drug. His last chapter is entitled "And our exact formula?" In this chapter he says:—"Evidently we shall give our exact formula some day. But before giving it we desire the medical profession to acknowledge our results and our reactions, and to state, 'officially' whether our treatment is specific for tuberculosis or not." Here the writer leaves us in the tantalising position in which the serial story writer leaves his readers with the foot-note "to be continued in our next;" but he does not even state when the "next" is to be.

One is forced to the conclusion that in spite of the M. D. at the end of the author's name he does not live up to the rule set before the medical profession of avoiding the advertisement of secret remedies.

The results which he illustrates, though apparently striking, still leave doubts in the critic's mind, and these doubts are by no means diminished by the tone of the whole book.

This new treatment may or may not have a great deal in it; but if it has it is certainly up to the discoverer, provided he believes in it himself, to disclose what his remedy is. Till then more favourable judgment must be suspended.

E. M.

**INTERNS' HANDBOOK.**—By Members of the Faculty of the College of Medicine, Syracuse University. Under the direction of M. S. Dooley, A.B., M.D. London: J. B. Lippincott Company. Pp. XIX plus 254. Price, 12s. 6d. net. Obtainable from Messrs. Butterworth and Co. (India), Ltd. Calcutta: Price, Rs. 9-6 net.

A HANDBOOK for interns in which an attempt has been made briefly to state the clinical methods in practically all branches of medicine. Most of the information is given in a tabulated form and is therefore easy of reference. It will be found useful not only by interns but also by the general practitioner. The small size of the book is an advantage in that it can be carried about in the pocket.

P. B.

**BIOLOGICAL REVERSION AND HIPPOCRATIC ANATOMY.**—By H. Higgins M.A., M.R.C.S., L.R.C.P. London: H. K. Lewis and Co., Ltd. 1929. Pp. IX plus 149. Price, 7s. 6d. net.

THE book under review is an eminently readable digression into subjects medical, psychic, metaphysical, poetical and other themes equally interesting. To define the scope of the work in the author's words "Biological reversion is a clinical method designed to define and rectify the consequences of chronic toxæmia." A detailed anatomical analysis is made of the skin, the subcutaneous tissues, connective tissues and muscles. The liabilities of under-nourished intoxicated tissues with faulty function and lymphatic stasis are then compared with the assets—normal tissues and normal function. Toxæmia is eliminated after a search for focal sepsis and the intestinal traffic restored by the devices described in the text. Regeneration is promoted locally by mechanical accelerated nutrition and generally by clinical metabolism. The mechanical treatment restores lymphatic circulation in a predetermined order and in addition provides useful indications for directing treatment by means of biological reactions excited by the manipulations.

This volume, treating of everything in general and of nothing in particular, should provide interesting reading to doctor and layman alike during leisure hours.

S. S. R.

**PRACTICAL LOCAL ANÆSTHESIA AND TS SURGICAL TECHNIC.**—By R. E. Farr, M.D., F.A.C.S. Second Edition. Thoroughly Revised. London: Henry Kimpton. 1930. Pp. XXIII plus 611 with 268 engravings and 16 plates. Price, 42s. net.

It has always been the aim of surgery to find out some means of abolishing pain during operative manipulations, and in old days various plans were adopted to attain this. Real advances in this direction were made quite recently. Anæsthetics have enabled

surgeons to tackle almost every region of the body, and instead of operations being hurried over they are now undertaken with much more deliberation and accuracy.

In the present volume the author deals with that form of anaesthesia which is obtained by paralysing the sensitive nerve-endings in the immediate neighbourhood of the operation by means of some agents or by temporary suspension of the conductivity of the main nerve trunks supplying the affected area. With the increase of interest of surgeons in local anaesthesia, many recent advances have been made in this realm and these have been carefully considered in the body of the book. The types of the different methods of administering local anaesthesia are dealt with in detail. The chapter dealing with the anatomy of the sensory nerves is a valuable contribution and it helps the reader to gain clear conception of the subject. The author has spared no pains in making himself clear with the help of engravings and plates. Local anaesthesia in surgery of all the regions of the body is described separately and we consider this a very valuable guide to surgical practitioners.

The whole book is written in a very convincing style and the author has presented the subject of local anaesthesia and its surgical technic to students and practitioners in such a way that there is little difficulty for them in grasping the idea and applying it in actual practice.

R. N. C.

**THE TREATMENT OF VARICOSE VEINS OF THE LOWER EXTREMITIES BY INJECTIONS.**—By T. H. Treves-Barber, M.D., B.Sc., with a foreword by H. W. Carson, F.R.C.S. Bristol: John Wright and Sons Ltd. 1929. Pp. 120. Illustrated. Price, 6s. net.

The injection method of treatment of varicose veins has been greatly appreciated by both surgeon and patient during recent years. There can be no doubt that the older operations of excision, however carefully and skilfully performed, very seldom resulted in a permanent cure and in all cases meant a lengthy convalescence and permanent disfigurement.

This little book is an epitome of the author's experience extending over several years, and therefore gives very practical advice and instruction. The opening chapters deal with the anatomy, pathology and symptoms of varicose veins and there is a very useful classification.

The main part of the book describes in detail the technique of the injection. The author invariably uses a sodium chloride solution and states that it has always given him the most gratifying results. Theoretically no solution could be safer, or simpler to prepare.

In India every house surgeon gives numerous intravenous injections, and frequently in difficult cases, so the actual operation should present no difficulty to most medical men here. The author is probably not exaggerating when he states, "No other branch of surgery can claim to have acquired, in such a short space of time, more satisfactory or more brilliant results than the sclerosing method for the obliteration of varicose veins."

Every surgeon in charge of a *mofussil* hospital and indeed all who have to perform minor operations should be in possession of this book. It will enable them to benefit their patients in a simple and efficient manner.

H. H.

**AIDS TO ORTHOPÆDIC SURGERY.**—By Mr. Erlo A. Crook, M.Ch. (Oxon.), F.R.C.S. (Eng.). London: Baillière, Tindall and Cox. 1929. Pp. VIII plus 232 with 17 figures in the text. Price, 3s. 6d. net.

ANOTHER addition to the *Aids* series. It will be found useful by students for quick revision before the examination. All important symptoms and methods of treatment are briefly stated.

P. B.

**A GRAPHIC GUIDE TO ELEMENTARY SURGERY.**—By Prof. Dr. Th. Næggel, Bonn. Translated by J. Snowman, M.D., M.R.C.P. London: John Bale Sons and Danielsson Ltd. 1929. Pp. 208 with 322 illustrations (mostly coloured). Price 12s. 6d. net.

AN excellent little book on elementary surgery, written and illustrated in a most interesting and original way. The word graphic describes the method of illustration very well. Each one of its 322 illustrations is highly practical and to the point, conveying a clear idea not only of clinical methods in surgery but also of various pathological processes.

The book will be found very useful both by students and teachers of surgery and none of them should be without a copy.

P. B.

**THE CHEMISTRY AND BACTERIOLOGY OF PUBLIC HEALTH.**—By C. L. Dunn, C.I.E., D.P.H. (Lond.), Lieut.-Colonel, I.M.S. and D. D. Pandya, D.P.H. (Cant.), Rai Bahadur. Calcutta: Butterworth & Co. (India), Ltd. 1929. Pp. XI plus 412. Price not stated.

It is perhaps a misfortune that most textbooks on Public Health and allied subjects have to be written either to a syllabus or for examinations. This fact rather cramps an author's style and limits originality; the chemistry, bacteriology and entomology of public health and preventive medicine in the tropics are perhaps capable of a much more expansive treatment than has been given here, and the authors might take up the suggestion later to write a book dealing specifically with chemical, bacteriological and entomological problems of public health in the tropics. As the authors state in their preface, however, the book is primarily intended for Part I of the D. P. H. examination and for routine work. This object they have successfully achieved.

The descriptions of methods throughout the book are clear and unambiguous and great care has been taken to keep matter and references up to date. The work of Williamson and Senior White on the effect of the chemical constitution of natural waters on anopheline breeding is noticed, and the important work on the differentiation of antigens of the O and R types indicated. We were disappointed to find no reference to Clemesha's work on the bacteriology of water in the tropics. Whatever opinions one may hold, this is work with which every public health student in the tropics should be acquainted.

The book will be found very useful both to students and workers in Public Health, and is recommended to all as a good treatise and reference book. The printing and binding are satisfactory.

A. D. S.

**SERUM DIAGNOSIS BY COMPLEMENT FIXATION WITH SPECIAL REFERENCE TO SYPHILIS—THE PRINCIPLES, TECHNIQUE AND CLINICAL APPLICATIONS.**—By John A. Kolmer, M.S., M.D., Dr. P.H., D.Sc., LL.D. London: Baillière, Tindall and Cox. 1929. Pp. XIX plus 583, with 65 text figures. Price, 31s. 6d. net.

DR. KOLMER is well known as the writer of very numerous papers on serological subjects, and in particular as the author of a special Wassermann technique which undoubtedly forms a contribution of permanent value. The author, while disclaiming any intention of reviewing the enormous literature of the Wassermann reaction, here summarises the results of nine years' clinical and laboratory investigations into this subject. His most interesting monograph deals with the application of complement fixation tests not only in syphilis but over a wide range of diseases.

Part I is devoted to a presentation of the principles of serum hæmolysis and complement fixation. In Part II the principles of technique are discussed, so that it may be understood how an extremely sensitive system can be combined with a high degree of specificity. So much harm has been done by defective



Wassermann work that the author has sought to discover and eliminate the various sources of error. In Part III the author gives detailed descriptions of his own techniques in the hope that other workers may follow them *exactly*. There has undoubtedly been too great a tendency to modify complement fixation techniques before the possibilities of the technique itself have been fully explored. Part IV is devoted to practical applications of the complement fixation method in the serum diagnosis of syphilis, tuberculosis, gonorrhoea, glanders, typhoid fever and many other diseases. While much more than a laboratory manual, the work will, on account of its highly technical nature, appeal mainly to serologists, the more so as the many most valuable practical hints are in our view its strongest part.

Dr. Kolmer writes with authority on complement fixation and his book is a valuable addition to the literature of the subject. We unhesitatingly recommend it to laboratory workers and to those clinicians, both in the field of human and veterinary medicine, who desire to familiarise themselves with the fundamental principles on which these tests are based and their clinical meaning under various sets of circumstances. The book is well got up, printed in clear type on good paper, and there are numerous clear illustrations, more particularly of methods of bleeding and of special apparatus.

R. B. L.

**HUMAN HELMINTHOLOGY.**—By E. C. Faust, Ph.D. London: Henry Kimpton. Pp. XXII plus 616. Illustrated with 297 engravings. Price, 36s. net.

THIS is by far the most comprehensive publication on helminthology as it effects the human host that has ever been produced, and it brings the existing knowledge of the subject right up to date.

The book deals with all phases of the subject, the description of a worm and its life history being followed by paragraphs on pathology, clinical symptoms, diagnosis, treatment and prophylaxis. The purely zoological portion of the book appeals to the reviewer as the best, the pathology and treatment being not so fully dealt with in many cases.

Although a very useful book of reference for the medical practitioner it is, on the whole, more a book for the zoologist, and the introduction of numerous new superfamily and family names with their definitions will be of little interest or value to the clinician, and will serve rather to confuse the mind of one not a specialist in zoology. It is doubtful whether the formation of higher groups is a sound proceeding in a book that deals with a very limited number of species in a given group, for it has always seemed to the reviewer that the more limited the number of species being dealt with in a classification, the more imperfect is such a classification when applied to the Class as a whole.

Three and a half pages are devoted to a list of parasites from human hosts, each name being followed by "The pathological designation for infection with the parasite." This appears rather unnecessary especially when it leads to such a condition as infection with *Braunia jassensis*, and which has only been recorded once, being designated "brauniasis jassensis." It is doubtful if this nomenclature will be followed to any extent by the medical profession, for it will possibly lead to some of the confusion that exists in zoological nomenclature being transferred to medical science. One case at least of this already exists where filariasis is now designated wuchereriiasis by some modern writers. This alteration in a well established name seems unnecessary, as although the generic name of the causative organism has been changed the worm is still a filaria in the broad sense, and it seems more reasonable to confine the pathological name of infection with this worm to the family or superfamily root followed by the specific name (e.g., filariasis due to *Wuchereria bancrofti*), which will be much more comprehensible to a medical man who is not a zoologist as well.

A few rather terrifying and difficult phrases to understand occur in the book such as, "Piscivorous amniotes serve as the definitive hosts" in referring to *Opisthorchis*, and it is rather unnecessary, as the next sentence says, "Some members of the superfamily live in mammals, others in birds....."

There is a useful list of references at the end of each chapter indexed under the names of the parasites to which they refer; although closer to the subject matter of the book wherein they are quoted they are not so rapidly accessible as in the usual place, at the end of a book, for one has often to turn over numerous pages to find the end of a chapter.

Section 4 deals with the laboratory side of the subject in a general way and it gives a useful outline of the approved methods of examining and preserving helminths and their eggs. The final chapter of this section is devoted to brief descriptions of the important intermediate hosts of worms. As the author says, this is only a bare outline, and that is all that can be given in a book of this size, but it should prove useful in enabling one who is not a zoologist in placing any given host in a family or even in a genus; the specific determination will always have to be left to the specialist.

On the whole the illustrations are well chosen, and there are many diagrams of life histories which give the salient points at a glance, and which will be of great assistance to beginners.

The book is well printed and the number of errors in type setting are remarkably few.

It is considered that it is a valuable publication to anyone dealing with purely human helminthiasis, and the only real criticism is that the considerable space devoted to pure zoology has made the book rather expensive for a practitioner who only occasionally has to deal with helminth infections, and who is only interested in the clinical and therapeutic side of the subject.

P. A. M.

**MEDICAL JURISPRUDENCE.**—By M. A. Kamath, M.B. & C.M. With the assistance of V. Vishwanathan, L.M.P. Third Edition (revised and enlarged). Calcutta: Butterworth & Co. (India), Ltd. 1929. Pp. IX plus 197. Price, Rs. 4.

THIS is a valuable epitome of the main facts of medical jurisprudence. The authors have revised and enlarged the present edition and a useful chapter dealing with the unconscious patient has been added.

Attention has been rightly drawn to the fact that available statistics regarding ossification refer to Western countries and it is reasonable to infer that epiphyse unite much earlier in India.

The appendices are of much help to the general practitioner as they deal with the method of holding post-mortem examinations, the issue of wound, lunacy, post-mortem and physical fitness certificates, and the method of sending viscera to the Chemical Examiner.

The presentation of facts is concise and clear but uncritical. The book remains as before a useful pocket textbook to help students through their examinations.

B. G. M.

**ULTRA-VIOLET RAYS IN THE TREATMENT AND CURE OF DISEASE.**—By Percy Hall, M.R.C.S. (Eng.), L.R.C.P. (Lond.), Fourth Edition. London: Messrs. William Heinemann (Medical Books) Ltd. 1929. Pp. XVIII plus 248 with 57 illustrations. Price, 12s. 6d. net.

It is only two years since the last edition was published. Since then the science of actino-therapy has advanced steadily, and as the author suggests, perhaps the most encouraging sign of the times is the realization that ultra-violet radiation should be administered only by the qualified and experienced.

This latest edition contains two new chapters. One on the vexed question of lamps for home use. Here it is pointed out that many of the lamps designed for the purpose are therapeutically inactive. Minute and regularly repeated doses are beneficial in the dull winter



months, but they should not be used indiscriminately, to the exclusion of the medical attendant, as vague ill health frequently precedes serious disease, and the delay involved may be disastrous.

The other chapter deals with dosage, and certain broad outlines are given to act as a guide to the operator. This should be very useful for the beginner, but it is pointed out that each patient is a law unto himself, and the safest plan is to begin with small doses and gradually increase them up to the limit of tolerance.

This little volume is now thoroughly up to date, easy to read, well illustrated and devoid of futile packing. We can thoroughly recommend it to anyone interested in the subject.

J. A. S.

**DENTAL LOCAL ANÆSTHESIA. OUTLINES OF DENTAL SCIENCE, VOL. XIII.**—By John James, L.D.S., R.C.S. (Eng.). Edinburgh: E. & S. Livingstone. 1929. Pp. 127 with 15 illustrations. Price, Rs. 5-10 per copy. Obtainable from Messrs. Butterworth and Co. (India), Ltd. Calcutta.

THIS is a concise book on dental local anæsthesia. The subject, it seems to us, has been shortened, at the expense of clearness. We feel that in such a short book, more illustrations would have been better. The instruments, the drugs, the various methods of injection and complications and contra-indications have been dealt with in a concise manner. We do not quite understand why the author recommends inserting the needle midway between the neck of the tooth and the apex of the root, in submucous anæsthesia. We feel that the majority of practitioners would vote for the universal method of inserting the needle at the apex of the root.

The book is a handy volume for the dental student. The last chapter entitled "conclusion" should be read by all students as it puts succinctly the viewpoint of an experienced practitioner and therefore should be thoroughly digested by all students and new practitioners.

The book is well got up and printed and does credit to the well known publishers.

R. A.

**ANNALS OF THE PICKETT-THOMSON RESEARCH LABORATORY.** Vol. IV, Parts 1 and 2. London: Baillière, Tindall & Cox. 1928-1929. Pp. XV plus 494, with 18 plates and 2 figures in the text. Price 42s. net per volume. Post free.

THE first monograph consists of an historical review of researches on the rôle of streptococci in rheumatic fever, by David and Robert Thomson. They first, appropriately, give a résumé of the researches on the various organisms which have come under suspicion as the cause of the disease, from 1885 to the present day. Numerous organisms have been suspected, but the streptococcus has been predominant throughout the whole period. They then deal with the blood changes, the vaccine treatment and the histology of the disease, its association with tonsillitis, and various other aspects of its epidemiology, such as its infectivity and the predisposing causes. Finally, there is a section entitled "The authors' conclusions." The first eight pages of this could have been more appropriately called "the authors' summary." In the last page and a half they give their judgment; this constitutes the "meat" of the whole monograph and we suggest that the busy practitioner who is interested in the subject should confine himself to this page and a half. The monograph also contains an excellent bibliography and 7 beautifully reproduced plates of photographs of streptococcal colonies.

Monographs II and III are short; they are historical reviews of researches on the rôle of streptococci in chorea, and erythema nodosum, respectively. Where-

as opinions are almost unanimous that chorea is a rheumatic manifestation, there is a feeble opposition to the theory of the association of erythema nodosum and rheumatic fever. We notice that Symes's monograph on the former condition does not appear in the list of references.

Part I of the volume is concluded with monograph IV, an historical survey of researches on the rôle of streptococci in carditis. The monograph is the largest of the four as we would expect it to be. Carditis, with its various aspects, subacute, acute simple and malignant endocarditis, myocarditis and pericarditis, is probably the most important disease of temperature climates.

The literature on the subject must be enormous and the authors have probably had considerable difficulty in separating the wheat from the tares. They give a useful summary at the end of the monograph.

The second part of the volume commences with a very short monograph (V) on suppurative arthritis, acute and subacute. In this condition streptococci play a more important part than do all other organisms put together; a plea is made for more accurate information regarding the type of organism present in this condition with the object of improving the treatment. Monograph VI is a far larger and more ambitious one and in it the editors have attempted to give an historical survey of the rôle of the streptococci in chronic arthritis. They first attempt to classify chronic arthritis and immediately encounter chaos. The main difficulty appears to be in distinguishing, and respectively defining, rheumatoid and osteo-arthritis; different writers appear to give diagonally opposite definitions for these two conditions. This section contains some excellent plates of streptococcal colonies, of histological sections, and of skiagrams to the joints of experimentally affected rabbits. The last monograph in the volume is an essay, rather than a review, of Rosenow's hypothesis of "elective localization" by H. Warren Crew. The term "elective localization" is not a very specific one and would have an entirely different meaning if used by Besredka, for example. By it Rosenow means the quality on the part of a micro-organism, a streptococcus, for example, of being able to acquire a specific affinity for certain tissues.

These *Annals* are reviewed regularly in the *Gazette* so that it becomes unnecessary to expatiate on the excellence of their "get-up"; as books they would add grace to the library of any bibliophile.

L. E. N.

## Annual Report.

**ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF BIHAR AND ORISSA, FOR THE YEAR 1928.** BY LIEUT.-COL. J. A. S. PHILLIPS, D.P.H., I.M.S., OFFG. DIRECTOR OF PUBLIC HEALTH, BIHAR AND ORISSA, PATNA, 1929, SUPDT., GOVT. PRINTING, B. & O. PRICE Rs. 3.

THE estimated population of the two provinces for 1928 was 34,004,546, upon which figure the statistics in Col. Phillips' report are based. The birth rate was high, 38.3 per mille as compared with a previous ten years' average of 37.2; the general birth rate in towns, 25.8, being considerably less than that in the rural districts, 38.7. The death rate was low, 25.3 per mille as compared with a rate of 31.5 for the previous ten years. Accordingly the year 1928 was in general a healthy one for the two provinces. The chief epidemic of the year was one of cholera, which broke out from June to August in the Puri district, as a result of infection imported from the Rath Jatra festival. Infant mortality was 131.8 as compared with a figure of 133.4 in 1927.

The accuracy of 21,538 vital occurrences was investigated, with the result that 418 omissions were detected, 306 prosecutions instituted, and 216 convictions obtained. Most municipalities, however, have dispensed with the services of their health officers, owing to the withdrawal of the Government contribution towards the pay of these officers, and the checking of vital statistics has deteriorated in consequence. In the towns statistics of births and deaths are furnished by the police and not by the municipalities. Experiments were made during the year by the simultaneous collection of statistics, both by the police and by the municipal commissioners, in Patna and Ranchi to enable Government to consider whether municipalities could without loss of efficiency be compelled to provide for the registration of births and deaths. It is as yet too early to come to any conclusion on this matter.

The covering Government resolution to the report records that maternity and child-welfare work has made no headway amongst municipalities. "Efforts in this direction are at present confined to the work done by two maternity supervisors appointed and paid for by Government in Patna and Cuttack, and to the work of an unofficial provincial maternity and child-welfare society which was registered during the year under the presidency of Lady Stephenson, and which has organized and helped to finance such work in these two towns.

Turning to the chief diseases during the year, *cholera* was important, with an incidence of 2.2 per mille as against a general ten years average of 1.8. Puri, Motihari, Darbhanga, and Barh all recorded high mortality from this disease. By April almost all districts in the province were infected, the Puri epidemic commenced with the Rath Jatra festival and spread to several other areas, whilst the disease did not subside generally until November. Apart from the usual reserve of ten special assistant-surgeons on anti-cholera duty, 20 additional epidemic doctors were employed during the year, whilst 105 vaccinators were also engaged on special anti-cholera duty. The use of kaolin in treatment is favoured by the reports of civil surgeons, whilst 241,703 doses of cholera vaccine were issued, as against 38,566 in the previous year. Inoculation is steadily making headway in the province and pilgrims at the different festivals come forward readily for inoculation and even persuade others to do so. At Puri the installation of a piped water supply is a very urgent need, and a detailed scheme for this is under consideration.

*Smallpox* was unimportant, a mortality rate of 0.4 as compared with one of 1.0 in the previous year. On the other hand, Col. Phillips reports that this sense of security is a very false one, and conditions are rapidly becoming very bad; only 328 per 1,000 children are vaccinated, and in the rural areas the introduction of compulsory vaccination is urged. "The vaccination state of the province cannot be regarded as satisfactory" writes Col. Phillips. "When a severe epidemic prevails the number of operations increases, but when the disease is not very prevalent, the number falls off. This state of affairs will continue until vaccination is made compulsory." At Hazaribagh the Civil Surgeon devoted a great deal of his time to this special matter, with great improvement in results, and in Patna, the District Board paid special attention to it. Government considered the feasibility of extending the provisions of sections 92 to 96 of the Local Self-Government Act, relating to vaccination, to district boards which employ qualified health officers, and at the close of the year correspondence was going on in this connection.

The death rate from *fevers* was 16.6, as compared with a general return of 21.8 for the ten previous years. Plague remained stationary during the year, and there was a very marked increase in the sale of quinine,—from 398 lbs. in 1927 to 529 lbs. in 1928. The free issue of quinine tablets to school children has been extended, and this measure appears to be

rapidly gaining in popularity. *Dysentery and diarrhoea* appear to be especially prevalent in the Orissa division, which reported 13,504 out of the total of 17,439 deaths which occurred in Bihar and Orissa during the year from these diseases.

Page 11 of the report gives two very interesting tables; the first shows that in municipal towns the proportion of total expenditure on sanitary measures to total income is 35.4, whereas for district boards the corresponding figure is 4.3. In Bihar and Orissa, as almost everywhere else in India, the development of public health is checked by acute financial stringency. "Government explained last year that they were unable to give financial assistance to any more district boards than at present for financing public health staffs," runs the covering Government resolution. "The working of these organizations in the various districts in which they have been started was inspected by the Public Health Department during the year, and the impressions obtained on their work were, on the whole, encouraging." A conference was held at Ranchi during the year to discuss improvement in the arrangements for medical inspection in schools. The introduction of a piped water supply for the Sonopore mela deserves special mention, as this fair is attended by thousands of pilgrims from other provinces in India.

The general position with regard to municipalities is very unsatisfactory. "Owing to the high prices still prevailing, and to the considerable increase in the wages of the staff, municipalities have been finding an increasing difficulty in maintaining the efficiency of their administration and equipment," writes Col. Phillips. "It is necessary to face a permanent increase in expenditure if municipal administration and conservancy are to be maintained even at the low standard previously attained. This means that their revenues must be increased, and this is one of the problems with which municipal and district boards are now faced, and one which they are reluctant to pursue. . . . The employment of suitably qualified health officers in all the large municipal towns is very desirable. Sanitary inspectors and health inspectors, however hard working, have neither the experience nor the training to enable them to replace health officers, and when an epidemic disease breaks out in the town, they seem to be both powerless and incapable of checking its spread." Epidemic doctors are essentially recruited for work in rural areas, and municipalities ought to be able to deal with their own problems without calling upon the Public Health Department for assistance in towns. And when economy is the order of the day, the first appointment to be scrapped is that of the district health officer, with the result that inefficiency sets in and public health deteriorates.

The propaganda work carried out during the year was very strenuous; "this work is appreciated and serves a very useful purpose in spreading knowledge," writes Col. Phillips. The Jharia Mines Board of Health continued to carry out excellent work throughout the year. In the Public Health Laboratory 1,250 examinations were carried out: 32.7 per cent. of samples of ghee, 74.2 per cent. of mustard oil, and 66.7 per cent. of milk samples were found to be adulterated,—figures which are unfortunately only too characteristic of Indian conditions. Legal action was taken during the year to enforce a standard for tea.

The report also includes the annual vaccination report for Bihar and Orissa for the year 1928-29. There are three vaccination circles in the province, and a total of 1,202,342 vaccinations was carried out. Col. Phillips records that more than half the total number of vaccination of "infants" is now carried out on children more than one year of age. There is very considerable popular prejudice, not against vaccination itself, but against the vaccination of young infants. The Vaccine Depot at Namkum continued to work very satisfactorily during the year. The cost per successful vaccination was Rs. 0-2-6.

## Correspondence.

### NOTES ON *ULCUS TROPICUM* IN THE JHARIA COALFIELDS IN 1922.

To the Editor, "THE INDIAN MEDICAL GAZETTE."

SIR,—Noting in your comment on Dr. Doshi's letter in the January 1930 issue of the *Gazette* that you had found the infection among the grass cutters of the Cavalry Regiments in the U. P. in 1909—11, I was struck by your finding as compared with mine in the

few notes I made upon the disease in late October 1922. The statistics are from four fairly large collieries which were then under my charge, and, although they differ somewhat in compilation, they curiously all make reference to the grass in the notes. The description of the ulcer and the treatment thereof have been omitted, they tally exactly with present day observations, with perhaps some difference in technique of treatment, but, it was then largely a matter of opinion and experiment as to the way in which the period of inefficiency of the sufferer could be shortened; all however are agreed in the main.

#### Kustore Colliery (the Rancegunge Coal Association Ltd.).

Year.	No. of Cases.	Date of Appearance.	Date of Total Disappearance.
1919 .. ..	120	7th June	6th December.
1920 .. ..	104	27th June	30th November.
1921 .. ..	46	3rd September	26th December.
1922 .. ..	44	22nd July	Up to the 31st October and still continuing.

Note 1.—Site of ulcer nearly always on the anterior aspect of the leg below the knee joint, most often on the ankle and dorsum of foot. May be single or multiple. Attacks mostly confined to adult males, less common in females, and rare in children. Two cases however were noted on the arm during these years.

Note 2.—Occurrence generally from the beginning of

the rainy season or certainly when the grass becomes long and "spear grass" abundant. Found in Punjabi coolies, Beidars, and Bilaspuri miners.

Note 3.—Treatment if taken in hand early generally lasted from 12—18 days. If much erosion had taken place and there was much oedema present, treatment was considerably lengthened.

#### Jamadoba Colliery (Messrs. Tata Iron and Steel Co.).

Year.	No. of Cases.	Date of Appearance.	Date of Total Disappearance.
1919 .. ..	109	July	November.
1920 .. ..	169	July	December.
1921 .. ..	98	June	December.
1922 .. ..	41	July	Up to October 31st and then still occurring.

Note 1.—Site of ulcer always below the knee and mostly found adjacent to the ankle joint and on the dorsum of the foot. There was at times much oedema below the ulcer level.

Note 2.—The figures for 1919-1920 should not be recorded as being all tropical ulcers, but undoubtedly the majority of them were so owing to the seasonal

occurrence. The percentage of persons afflicted was much higher in the case of adult males. In 1920 only 2 children were affected and none in the other years under question.

Note 3.—From the records, it would appear that the disease reaches its height concomitant with the height and ripeness of the grass, and, that Beidars and others who work on the surface are more often affected.

#### Sigma Colliery (Messrs. Tata Iron & Steel Co.)

Year.	Total.	Appearance of 1st ulcer.	Date of total disappearance.
1919 .. ..	146 (including 4 females and 1 child)	July	December.
1920 .. ..	82 (including 6 females and 4 children)	June (late)	January 1921.
1921 .. ..	52 (including 9 females and 2 children)	July	December.
1922 .. ..	112 (including 6 females and 2 children)	June (late)	Up to October and still continuing.

Note 1.—The disease was noted on no other part of the body except the leg below the knee.

Note 2.—The disease is generally found in the months where the grass is highest and rankest, and has been most commonly found amongst the male earth cutters.

#### Malkera Choitidih Colliery (Messrs. Tata Iron & Steel Co.)

Year.	Number of ulcers.	Appearance.	Disappearance.	Length of period of inefficiency.
1919 .. ..	75 (females 5, children nil)	July	January 1920	12 to 16 days.
1920 .. ..	55 (females 4, children nil)	July	December	10 to 16 days.
1921 .. ..	80 (females 3, children 1)	August	December	10 to 15 days.
1922 .. ..	91 (females 5, children 2)	July	October 21st and still continuing.	10 to 15 days.

Note 1.—The ulcer is generally found on the lower one-third of the leg, more often on the anterior than on the posterior aspect. Mostly confined to the ankle and dorsum of the foot. May be single or multiple.

Note 2.—The percentage of affliction is found to be strikingly higher in adult males than in females, children being rarely afflicted. The age incidence varies from 20 to 45, and it is noted to be rare among elderly people.

Note 3.—Mostly seen amongst the poorer classes, but also found amongst the Punjabi coolies, Bilaspuri miners,

and surface coolies. A single instance in 1921 occurred in a Babu's family.

Note 4.—It may be of some interest to note that the ulcers are more prevalent at the end of the rainy season when the grass is long and in the seed-bearing stage.

You will thus note how strikingly the grass is blamed throughout. The rough notes were compiled by my assistants, who were not in communication with each other and were "boiled down" for my report to the Managing Agents. They all appear to have associated this element as a possible factor in the causation of the

ulcer, and, curiously enough, after a quiescent period the ulcers reappeared in great numbers in 1929, concomitant with a heavy monsoon and a consequent luxurious crop of grass!—Yours, etc.,

FRANK T. SIMPSON,  
Chief Medical Officer,  
Messrs. Kilburn & Co.'s Collieries.

KUSTORE,  
P. O. KUSUNDU, E. I. RY.,  
MANRHUM DISTRICT,  
30th January, 1930.

### ULCUS TROPICUM IN KANARA DISTRICT.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I was much interested in the two accounts in the *Gazette* for December, 1929, and January, 1930, of a special kind of ulcer ("Naga sore") on the leg encountered by the writers in Gwalior and Rajputana respectively. From the authors' description of the sore, its site, its mode of onset, its resistance to anti-syphilitic measures, its relationship to economic conditions, and its common association with an enlarged spleen, I have no hesitation in identifying it with a certain variety of ulcer which occurs in South Kanara district, and runs an exactly similar course from beginning to end. The first few cases that I encountered I attributed to a possible syphilitic manifestation, but I soon found out my mistake. I then thought of ankylostomiasis, but was shortly able to rule that out. Some 80 per cent. of these cases show definite splenic enlargement, and many of them a well established condition of malarial cachexia.

Being in a remote and poorly equipped dispensary, I have had to rely on clinical experience only, and, by way of treatment, have so far hit upon no remedy which can be said to be truly specific. After trial of a variety of antiseptic dressings, I now use simple dressings with 1 : 2,000 hydrarg. perchloride lotion. Anti-syphilitic remedies are of no value in checking the disease. Internally I administer potassium iodide or triple sulphates as tonic alteratives. Daily changes of dressings are insisted on, but in spite of all care, the condition runs a prolonged and tiresome course towards recovery.

There is no possibility of guinea-worm infection in this part of the country.

I should be glad if Dr. Doshi would inform your readers of the details of "Dr. Hugh Smith's method" of treating these ulcers.—Yours, etc.,

BYNDOOR, A. S. HEBBAR, L.M. & S.,  
SOUTH KANARA DISTRICT. Medical Officer.

(Note.—The treatments suggested at various times by different writers for the condition are legion. Intravenous injections of antimony preparations—often so useful in venereal granuloma—appear to be useless. Daily dressing with gauze soaked in hypertonic saline has its advocates; also eusol. Surface cauterisation of the entire ulcer—if not too large—with pure carbolic acid, immediately followed by neutralization with alcohol, has been advocated by some; but such a line of treatment might set up a risk of carbolic acid poisoning. Stitt mentions that Castellani advocates a preliminary cleaning with hydrogen peroxide, followed by a 5 to 10 per cent. protargol ointment. He also states that "an 8 per cent. scarlet red ointment should be tried on these sores when treatment with ordinary applications fails."

(Dr. Hugh Smith's treatment referred to by Dr. Hebbbar, is a method of prophylaxis (*Indian Med. Gaz.*, April 1929, p. 239). Each coolie, on returning from plucking leaf, is made to walk through a trough from 20 to 60 feet long, divided into two compartments: the first containing clean water, and the second a phenyl solution of sufficient depth to cover the lower third of the leg; the object being that the legs shall be cleansed in the first compartment, and disinfected in the second.—EDITOR, I. M. G.)

### TANNIC ACID IN THE TREATMENT OF BURNS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—During the past few years, tannic acid has come into considerable vogue for the treatment of burns. As House Surgeon in the Sir J. J. Hospital in Bombay in 1927-28 I had to treat many cases of burns, but was unsuccessful with tannic acid. I asked my chief, Mr. S. R. Moolgavkar, F.R.C.S., as to the reason for this, and he gave me the following advice: first wash the burnt part thoroughly with 1 : 1,000 hydrarg. perchloride lotion, and then apply the tannic acid lotion, which must be freshly prepared.

Since being posted to this district I have had three very severe cases of burns, and have applied the above treatment with very successful results. Details of the cases were as follows:—

Case 1.—Lachii, motor driver, aged about 20 years, admitted on 7th March, 1929, with burns due to lighted petrol. Both hands and both lower extremities were burnt, also the face. An injection of morphia was given immediately to control pain. The affected parts were well washed with hydrarg. perchloride lotion, and blisters snipped. A layer of lint soaked in 5 per cent. tannic acid solution was then applied, a layer of cotton wool over it, and then a bandage. An injection of anti-tetanic serum was given, and the usual measures taken to combat shock. Next day the entire burnt areas were covered by a black slough, and daily applications of the tannic acid dressing were continued. The sloughs separated leaving a healthy granulating surface. The parts were then treated with a 5 per cent. tannic acid ointment, and later with sterile boracic ointment. There was complete recovery with no contracture, and in 2½ months the patient was back at work.

Case 2.—Kalu, police constable, was admitted on the 11th July, 1929, with his whole leg up to the middle of the thigh burnt with gunpowder. The other foot was also partially burnt. The same treatment as above was applied, but in place of tannic acid lotion, 5 per cent. tannic acid ointment was used throughout. The patient made a complete recovery, without contracture.

Case 3.—A female patient, aged 13 years, admitted on 21st July, 1929, with extensive burns from below the breast to the lower part of the knees, as the result of her sari catching fire. The hands and forearms were also burnt, as well as the front of the abdomen. The treatment was the same as in Case 2, tannic acid ointment being used. Recovery was complete without any contracture.

I have seen cases of burns treated with tannic acid by means of a spray. In my opinion this method is costly, and the treatment with a 5 per cent. ointment is simpler. The chief advantage of the spray method is that there is no necessity to bandage the part. In applying the ointment I have never had any occasion to use a hypnotic, and the dressings do not stick to the part as with a tannic acid lotion.—Yours, etc.,

MALUM SINGH B. DOSHI, M.B., B.S., B.S.C.,  
Chief Medical Officer.

DUNGARPUR,  
RAJPUTANA,  
22nd January, 1930.

### "ARS OBSTETRICA."

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In your issue for January 1930, Lieut.-Col. V. B. Green-Armytage has recorded his extensive clinical experience in regard to general obstetric practice under the above heading. A point in this connection which I may be permitted to mention relates to his class II variety of cases of albuminuria observed during pregnancy. The history of such a case is as follows:—

Mrs. J., aged 18, pregnant 8 months, was admitted to hospital in an almost unrecognisable state, owing to œdema all over the body. Examination of the urine showed a flocculent deposit of albumin. The pulse was

of high tension, and the onset of eclampsia threatened every moment. Milk diet, rest, and the usual treatment for albuminuria failed to relieve the condition after a week's treatment.

It occurred to me that dried liver extract has an almost marvellous value in several toxic states and in reducing high blood pressure, and I administered one day one tube (P. D. & Co.) extract, equal to  $3\frac{1}{2}$  ozs. of fresh liver. On this line of treatment all traces of oedema disappeared within less than a week, and the quantity of albumin in the urine decreased, though albumin was still present in traces after delivery. Headache and visual symptoms disappeared, and the patient underwent a normal delivery.

This line of treatment appears to be worth a trial in cases of threatened eclampsia.—Yours, etc.,

V. S. UMACHIGI, L.M. & S.

GADAG,  
14th February, 1930.

### KURCHI EXTRACTS IN AMOEBIASIS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In the *Indian Medical Gazette* of the February number Dr. Akhil Ranjan Mozumder, M.B., published an article on the use of "Kurchi bark in Dysentery." The results of Dr. Mozumder's analysis of the alkaloidal contents of our preparation and that of some of our competitors, whose specimens we have analysed, was, in our opinion, totally incorrect.

The alkaloidal contents of the Union Drug Co.'s Liquid Extract of Kurchi is 0.8 to 1 per cent., the percentage varying slightly; that this slight variation is unavoidable is a fact well known to all chemical experts.

I standardize the Union Drug Co.'s Liquid Extract of Kurchi in a special way, as I have found that the process of standardization generally followed is not only cumbersome, but most unreliable.

Before mentioning the names of different firms and characterizing their products as "extracts-below-standard," Dr. Mozumder ought, in our opinion, to have invited the chemists of the different firms to criticize the chemical portion of his report. He has informed me in a letter that he depended upon a friend, the chemist attached to a rival commercial concern, and was guided by him in the chemical portion of his research. The result has been that Dr. Mozumder was misled and a ridiculously incorrect and prejudiced report published.

Dr. Mozumder has made out a case in favour of standardized Liquid Extract of Kurchi by asserting that the particular brand he recommended can be offered in the market at Rs. 2 per lb., duty free. The privilege of getting alcoholic extracts duty free is restricted only to Government institutions, and to a few charitable dispensaries. But, what about the general public? They must certainly pay much more than Rs. 2 per lb., because the excise duty must be added to this price. But let us take the case of Rs. 2 per lb., which, in Dr. Mozumder's estimation of 1 per cent. alkaloidal contents, yields 4.5 grms. of total alkaloids. This means that the privileged consumers, who pay no duty, will have to buy 2.25 grms. of total alkaloids per rupee. Is this cheap as compared with Kurchi Bismuthous Iodide? We sell this alkaloidal salt, under the name of Kurchibine, to the Government institutions, District Boards and all charitable dispensaries at 3.5 grms. of alkaloids per rupee.

I leave it to you, Sir, to say which treatment is cheaper—Cols. Acton and Chopra's kurchi-bismuthous-iodide, or Dr. Mozumder's liquid extract of kurchi.

I beg to thank you for providing me with space to publish the real facts, which I can prove in any authoritative institution.—Yours, etc.,

B. N. GHOSH, M.Sc., & P.R.S.

(Cal.), D.Sc. (Lond.), F.C.S. (Lond.).

Union Drug Co., Ltd.

86, CLIVE STREET, CALCUTTA,  
20th February, 1930.

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

Colonel W. H. C. Forster, M.B., I.M.S., Inspector-General of Civil Hospitals, Burma, is appointed to be Surgeon-General with the Government of Bombay, with effect from the 27th January 1930.

Lieutenant-Colonel T. F. Owens, I.M.S., Chemical Examiner to the Government of Burma, is appointed to officiate as Inspector-General of Civil Hospitals, Burma, in addition to his own duties with effect from the 13th January 1930 (afternoon) and until further orders.

On reversion from the cadre of Agency Surgeons under the Government of India in the Foreign and Political Department, the services of Major M. Fazluddin, O.B.E., I.M.S., were placed at the disposal of the Government of India in the Home Department, with effect from the 20th January 1930.

The services of Major M. A. Jafarey, I.M.S., are placed at the disposal of the Government of the United Provinces for employment in the Jails Department with effect from the forenoon of the 28th January 1930.

Major W. C. Spackman, M.B.B.S. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.T.M. (Lond.), I.M.S., to officiate as Resident Medical Officer, St. George's Hospital, Bombay, until further orders.

The services of Major L. H. Khan, I.M.S., are placed permanently at the disposal of the Government of Central Provinces for employment in the Jails Department.

Major C. M. Plumpton, F.R.C.S.E., M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., to officiate as Civil Surgeon, Sholapur.

Major A. H. Harty, M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., Resident Medical Officer, St. George's Hospital, Bombay, to officiate as Civil Surgeon, Sukkur, *vice* Rao Bahadur P. T. Kothary, B.M.S., transferred.

Subject to His Majesty's approval, the undermentioned officers, whose appointment on probation was notified in the London Gazette dated the 12th October 1928 (*see* Army Department Notification No. 1547, dated the 17th November 1928), are confirmed in the following order, on passing the necessary courses of instruction:—

Captain F. R. W. K. Allen, M.B.  
Lieutenant A. V. O'Brien, M.B.  
Lieutenant S. T. Davies.  
Lieutenant E. S. S. Lucas.  
Lieutenant H. W. Farrell, M.B.  
Lieutenant J. S. McMillan, M.B.  
Lieutenant V. E. M. Lee.  
Lieutenant M. R. Sinclair.  
Lieutenant G. B. W. Fisher, M.B.  
Lieutenant R. A. Paton.  
Lieutenant G. F. Condon.  
Lieutenant H. S. Smithwick, M.B.  
Lieutenant D. Tennant.

The services of Captain D. P. Bhargava, M.B., F.R.C.S.E., I.M.S., are placed temporarily at the disposal of the Government of the United Provinces with effect from the date on which he assumes charge of the duties of Principal of the Medical School at Agra.

### LEAVE.

Colonel W. V. Coppinger, C.I.E., D.S.O., M.D., F.R.C.S.I., Inspector-General of Civil Hospitals, Central Provinces, is granted leave on average pay for 3 months and 21 days combined with leave on half average pay for 3 months and 9 days with effect from the 10th March 1930.

In supersession of previous orders, Lieutenant-Colonel T. C. McCombie Young, M.D., D.P.H., I.M.S., an officer of the Medical Research Department on foreign service under the Indian Research Fund Association, is granted leave on average pay for 6 months and 13 days combined with leave on half average pay for 17 months and 17 days, with effect from the 5th May 1928. His services are replaced at the disposal of the Director-General, Indian Medical Service, with effect from the same date.

In supersession of previous orders, Lieutenant-Colonel N. M. Wilson, O.B.E., I.M.S., Civil Surgeon, Simla West, is granted leave on average pay for 3 months and 22 days with effect from the 7th November 1929, and his services are placed at the disposal of the Government of the Punjab, from the 1st March 1930.

In modification of previous orders, Major G. C. Maitra, I.M.S., Officiating Assistant Director, Central Research Institute, Kasauli, is granted leave on average pay for eight months with effect from the 1st September 1929.

In supersession of previous orders, Major L. K. Ledger, I.M.S., an Agency Surgeon, was granted leave on average pay for 2 months combined with study leave for 7 months and 7 days and in continuation leave on average pay for 5 months and 13 days, with effect from 23rd February 1928.

#### PROMOTIONS.

##### Colonel to be Major-General.

J. D. Graham, C.I.E., M.B. (Supernumerary) dated 11th December 1929.

##### Majors to be Lieutenant-Colonels.

F. J. Kolapore, E. G. Kennedy, M.B., J. V. Macdonald, M.C., M.B., H. A. H. Robson, M.B., C. G. Howlett, M.B.—Dated 29th January 1930.

C. Newton-Davis, M.C., M.B., R. C. Clifford, D.S.O., M.C., F.R.C.S.E., C. Newcomb, M.D., H. E. Shortt, M.B., T. A. Hughes, M.D., H. L. Batra, M.C., D. McN. Taylor, M.B., W. O. Walker, M.B.—Dated 30th January, 1930.

##### Captains to be Majors.

A. Ba Thaw, M.B., dated 15th January 1930.

A. K. Sahibzada, M.B., dated 30th January 1930.

##### Lieutenant to be Captain (Provisional).

W. J. L. Neal, dated 26th August 1929.

#### RETIREMENTS.

Lieutenant-Colonel W. G. Hamilton, I.M.S., from the 4th October 1929.

The King has approved the retirement from service of Lieutenant-Colonel H. A. Williams, D.S.O., M.B., I.M.S., from the 11th January 1930.

## NOTES.

### LONDON MEDICAL EXHIBITION.

HORTICULTURAL HALL, WESTMINSTER,  
OCTOBER 14TH TO 18TH, 1929.

#### Notes on Burroughs Wellcome & Co.'s Exhibit.

SEVERAL products issued as a result of scientific research, and other preparations of topical interest were shown by Burroughs Wellcome & Co. An outstanding feature was the series of illuminated cabinets. In one was indicated the sources of eight typical medicaments of vegetable origin used in the production of well-known products of the firm. These consisted of hand-painted illustrations of the plants, the beauty of which would entitle them to attention on this score, apart from their professional interest. In a companion cabinet were shown novel illustrations of the sources of eight typical medicinal substances of animal origin together with "Tabloid" products prepared from them. The causative organisms of certain specific diseases were similarly shown as illuminated coloured photo-micrographs. Associated with these were products used in the diagnosis, prophylaxis and treatment of the diseases concerned.

Prominence was given to "Tabloid" Alkaline Compound, Effervescent, a therapeutic agent with a three-fold purpose. It may be used (1) as an antacid draught, (2) to correct hypo-alkalinity associated with gastric disturbance of various kinds, or (3) to restore the alkaline balance and assist re-mineralization in the condition now known as acidosis.

A coloured chart illustrated a test for the Vitamin B content of "Kepler" Malt Extract. "Kepler" Malt Extract is an important source of Vitamin B and "Kepler" Cod Liver Oil with Malt Extract presents Vitamins A, B and D in their natural form and association.

Burroughs Wellcome & Co., have issued a new, and, what is important, a really stable digitalis product—"Diginutin"—consisting of a solution of the total glucosides of digitalis leaves freed from inert vegetable matter. "Diginutin" may be used in place of the tincture.

"Tabloid" Brand Hypodermic Bulbocapnine Phosphate was shown as an adjunct to the treatment of certain phases of epidemic encephalitis. This alkaloid is derived from the root of *Corydalis cava*. In dealing with the disorders of behaviour in children, which frequently supervene in this condition, considerable success has attended the administration of bulbocapnine.

A mortality chart recorded the results of insulin treatment on 1,316 patients and indicated how case-fatality has decreased as a result of improved technique. A specimen of crystalline insulin from which Burroughs Wellcome & Co. insulin products are prepared was also available for examination.

### THE BLOODLESS PHLEBOTOMIST.

THE Denver Chemical Manufacturing Co., New York, the manufacturers of the very well-known product Antiphlogistine, continue the publication of this well edited little journal, and have recently issued Vol. VII, No. 3. This contains an abstract from the work of Schaffer, which shows that the application of hot moist dressings in inflammatory conditions is productive of better results than the application of either dry heat or cold,—an article illustrated by microphotographs. Dr. S. J. Tchechulin of the Chemicco-Pharmaceutical Institute of Moscow details experiments carried out with a view to resuscitating the severed head of a dog, and keeping it alive. The cardinal difficulty to be overcome in these experiments was not to supply an artificial heart and blood supply, but to give a blood supply containing oxygen in such form that the cerebral tissues could absorb it. This was found by using normal dog's blood, after treatment of the animal with Germanin (Bayer 205) to prevent coagulation. The severed dog's head, and the normal reflexes, were kept living for up to four hours.

The editorial deals with the need for local and topical treatment in inflammatory affections, whilst an interesting account is given of the Gastro-Photot apparatus. This is designed to take minute photographs of the interior of the stomach, which, when enlarged, can be studied for pathological changes; and it should largely do away with the necessity for exploratory laparotomies. A most quaint article is one by Robert Francheville on the planets and medicine, illustrated by delightful woodcuts; the author discusses from medieval sources the influences of the planets on temperament and disease. We gather that the infant who is to be a doctor should choose to be born on a Wednesday, but he is liable to suffer from the gout, and will have three wives.

### VITAMINE D.

THE history of the work on vitamine D is of considerable interest. At the outset of research on the vitamins, it was confused with vitamine A, since both are present together in fresh cod-liver oil, McCollum, however, identified it as a different and anti-rachitic principle by oxidising cod-liver oil, thereby destroying vitamine A, but yet being able to cure rickets with the product which remained.

About the same time Dr. Steenbock of Wisconsin University, discovered that foodstuffs could be endowed with anti-rachitic activity by means of radiation from mercury vapour and other ultra-violet ray lamps—a discovery of the utmost importance. It was found that irradiated cholesterol would cure rickets, but later that highly purified cholesterol was unaffected by irradiation. The suggestion was therefore made that an impurity associated with cholesterol—probably another sterol—was the precursor of vitamine D. In 1926-27 Rosenheim and Webster in London, Hess in New York, and Windhaus at Gottingen, almost simultaneously identified ergosterol as the pro-vitamine substance.

The preparation of vitamine D by the irradiation of ergosterol is thus the outcome of Steenbock's researches.



and products prepared by and marked "Steenbock Process" are therefore reliable. Such a step is now not infrequently taken by research workers who desire that their results shall not be unscrupulously exploited, and that only reliable products shall be placed on the market. The period of radiation of ergosterol is important, for if under-irradiated it is worthless, and if over-irradiated the vitamin D is destroyed. Further, the product has to be biologically standardised after preparation.

The agents in India for the Steenbock product are Messrs. H. J. Foster & Co., 13, Government Place, East, Calcutta, who will be glad to supply information. Vitamin D, in the form of irradiated ergosterol, has a very wide range of application, being used in rickets, tuberculosis, osteomalacia, pregnancy and lactation, corneal ulcer, and defective dentition. We trust that investigations will be carried out into the keeping properties of this, and other vitamin products, under tropical conditions—a point to which attention has been called by contributors to our columns.

### SICCOPAN.

THIS is a new hæmoglobin preparation, manufactured by the original makers of dried hæmoglobin, the Sisco Chemical Works, Berlin. It is stated that it consists of a pure hæmoglobin in powder form, with the addition of lecithin albumin, calcium lactate, and silicic acid. A report by Dr. Fritz Stern of the Berlin-Lankwitz Hospital speaks highly of results with it. The product was found to be completely soluble in water, readily assimilated, and only excreted in inconsiderable amounts; only traces could be detected in the feces after its administration. Patients to whom it was administered showed a fairly constant increase of from 15 to 20 per cent. in the hæmoglobin content, and an increase in weight. The preparation appears to be especially suitable for anæmic and convalescent patients.

The British agents, Messrs. Coates & Cooper, 41, Great Tower Street, London, E. C. 3, follow strictly ethical lines in bringing forward notice of new preparations to the medical profession only. The claims made for Sisco are restrained and not exaggerated. For both reasons we consider that the new preparation may be of interest to the medical profession.

### MARMITE.

MARMITE is so well known a product, and with so well established a reputation, that we need only draw our readers' attention to it briefly. Essentially it is a yeast preparation designed to supply the vitamin B in which modern dietaries are usually very deficient, and which cannot be stored up in the body metabolism. One of the most striking instances of its value was its use during the Great War. In January 1916 beriberi broke out among the troops in the Gallipoli peninsula, and Dr. C. J. Martin, F.R.S., recommended the addition of yeast to the soldier's daily ration. Lieut.-Col. Monkton Copeman, then in charge of the Hygiene Department of the Royal Army Medical College, however showed that Marmite possessed the advantage over crude yeast of remaining practically unchanged when exposed to the air. Miss Chick and Miss Hume, in their well known work on the distribution of anti-beriberi vitamins, also reported very favourably on the product. Accordingly two preparations were manufactured; Marmite cubes or tablets, and Marmite S<sub>2</sub>, which consisted of two-thirds Marmite and one-third concentrated essence of onion, carrot, aromatic herbs, and bacon extract. In the latter preparation cotton seed oil was later substituted for bacon fat in order that the preparation could be issued to Indian troops. Supplies were sent to Gallipoli, and monthly supplies, which finally totalled 10,000 lbs. a month to Basra for the Indian Expeditionary Force in Mesopotamia. The preparation was also used extensively in the parcels of food sent to British prisoners of war in Germany and Austria. The result was that beriberi was abolished (Sir David Bruce, inaugural address at the annual meeting of the British Association for the Advancement of Science at Toronto, 1924).

All experiments carried out with the preparation on experimental animals, chiefly rats and pigeons, have proved its value, and that it retains a considerable supply of vitamin B. It can be added to soups or gravies, or taken in the form of sandwiches, added to poached eggs, or to custard. The uses of this preparation are very numerous; it is of value in promoting growth in marasmic and weakly children; in promoting fat assimilation in constipation, defective digestion, and diabetes; in inducing leucocytosis in all conditions of chronic sepsis; and of special value in the dietary of nursing mothers.

The manufacturers of Marmite—the Marmite Food Extract Co., Ltd., Mincing Lane House, 59, Eastcheap, London, E. C. 3—are studiously restrained in their claims for the preparation, and strictly ethical in their advertising. But the preparation has now so well known and so established a reputation that it needs no further recommendation on our part. A detailed account of its use during the war will be found in the *Official History of the War, Vol. II, Medical Services, Hygiene of the War*, Chapter III, pp. 83–86, by Major-General Sir W. MacPherson, Col. Sir W. H. Horrocks, and Major-General W. W. O. Beveridge.

### THE SOLLUX LAMP.

THE use of luminous heat rays for the treatment of inflammatory processes is one of the most interesting and important of the recent advances in electro-therapeutics. Practically speaking, the method is an adaptation of Bier's method of inducing local hyperæmia, but differs from the latter in that applications can be accurately controlled, and that the application is far more convenient and pleasant than with Bier's method.

In this connection the British Hanovia Quartz Lamp Co., Slough, Great Britain, have produced their Sollux Lamp, and will send an illustrated brochure with regard to it on application. This apparatus is designed, (a) as a stand model, and (b) as a suspension model. Several different types of localizers are illustrated for use with the lamp, and for application to different parts of the body. Essentially what the treatment aims at is to relieve pain in all cases of localized inflammation, to cause subsidence of the inflammatory process, and to lead to the early clearing up of the morbid condition. It is claimed that the lamp is of special value in dental and oto-laryngological work; of value in localized sepsis, rheumatism, neuralgias, gout, and lumbago; and in all conditions where it is desired to produce a localized hyperæmia.

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## Original Articles.

### THE MATERNITY CONDITIONS OF WOMEN MILL-WORKERS IN INDIA.

By MARGARET I. BALFOUR, C.B.E., M.B., C.M.,  
and

SHAKUNTALA K. TALPADE, M.B., B.S.

(An Enquiry carried out under the auspices of the Indian Research Fund Association, Haffkine Institute, Bombay.)

THERE is little real information in India about the maternity conditions of women mill-workers. It is generally believed they are bad and that special action is needed, but unless we get more definite knowledge of the effect of maternity on women workers there is danger that the remedies may prove wide of the mark and unsuited to the needs of the women.

Amelioration of the conditions of women mill-workers is not of importance for sentimental reasons only. One of the difficulties connected with labour in India is the shifting nature of the industrial population. Men come from their villages leaving their wives behind and as soon as they have saved a little money they are eager to go back to enjoy the amenities of home life. They are the more ready to strike because they have a village home to return to. When the worker brings his wife to the city and perhaps his children too, his work and its steady continuance becomes of much greater importance to him. If his wife also works in the mill, he has a larger stake in its prosperity. Hence thought and organization regarding the employment of women will do much, not only to improve their own work, but to render the employment of men more dependable and stable.

The special disability under which women suffer with regard to work is maternity. How is that affected by work? Is the mother adversely affected, and is the child adversely affected? And if so, can anything be done to remedy matters without shutting the woman off from a source of livelihood which is well within her powers at ordinary times?

Interest in this question was aroused in India after the first International Labour Conference held at Washington in 1919,<sup>(1)</sup> where Articles were passed in the Draft Convention, providing for the safeguarding of maternity among women workers. It was required that each expectant mother should have six weeks rest before and six weeks after confinement, and that she should be paid benefits sufficient for the full and healthy maintenance of herself and her child. At this Conference the special circumstances of India were recognized and it was not expected that she should adopt these articles at once.

But she was asked to look carefully into the matter and find out what could be done to put the maternity conditions of women workers on a proper footing. The Government of India thereafter addressed Local Governments asking how far it would be possible to introduce maternity benefits or at least to carry out an enquiry as to the need of them. The replies from Local Governments were not encouraging. The situation was the same then as now. The Local Governments did not wish to undertake the expense, either of an industrial maternity scheme, or of an enquiry. The employers of labour were in the same position—while it was felt that the workers were at once too poorly paid and too ignorant regarding their own welfare to be willing to contribute the small sum necessary for an insurance scheme. In the year 1921 the Secretary to the Government of India in the Department of Industries and Labour, Mr. A. C. Chatterjee, called a meeting at Simla of various persons, representing chiefly medical and social organizations, to discuss the question and to ask for suggestions. As a result of that meeting an offer was made by the Countess of Dufferin's Fund to give the services of two medical women for an enquiry on the maternity conditions of women industrial workers in two different parts of India. This offer was accepted by the Government of India and by the two Local Governments concerned, Bengal and Bombay, and in the year 1921-22 enquiries were carried out in Bengal by Dr. Dagmar Curjel and in Bombay City by Dr. Florence Barnes.

These medical women were lent from the Women's Medical Service for one year only. The object was "to determine the influence which industrial work might exert on the Indian woman worker, especially during the child-bearing age and on the well-being of her child." The enquiry in Bengal included the jute, cotton, tea and coal industries, and in Bombay the cotton industry.

Both reports [(2) and (3)] give a great deal of valuable information as to the conditions under which women work in India and as to their domestic and social relations. They make it plain that childbirth is looked upon as something quite outside the province of the employers. Medical relief for ordinary ailments may be provided by means of mill doctors and mill dispensaries but no arrangements are made for childbirth. An expectant mother disappears when her time is near and reappears when she wishes. She may, or may not, be taken on again. The factory has no information to give regarding her confinement, her child, or the frequency of her pregnancies. Hence these medical women's reports could only give general information such as the facts that many women were confined in their own *chawls* by *dais*, while others returned to their village homes for the occasion. They had no time, nor had they any opportunity to follow the women through their

confinements and to note the immediate results to mother and child.

Following the issue of these reports and in consequence of them, welfare centres were started in certain mills in Bengal, while in Bombay a medical woman was appointed with the status of factory inspector with the special task of organizing welfare work among women. There are now crèches in connection with thirteen mills, while maternity benefits have been given for some years by two groups of mills in Bombay City.

In the year 1925, having received a grant from the Indian Research Fund Association, Simla, for the investigation of the causes of maternity mortality in childbirth in India, we began work in Bombay and included the maternity conditions of mill-workers with those of other classes. Our intention in doing so was to supply what we felt was a lack in the earlier reports, and to collect evidence as to the actual effect of work on pregnancy as it occurs in women living under the conditions of the Bombay mill-workers. For this purpose it was necessary to keep records of the deliveries of a number of women workers, of a control series which was best found in women of the mill-working community living under the same social conditions but not employed in the mills, and a second series of controls, women of a rather better social position delivered in other hospitals in Bombay.

The facilities for such an investigation which did not exist before had been provided by the opening in 1923 by Sir Ness Wadia of a maternity home in the mill area, specially intended for mill-workers. In 1927 this home was moved to the fine new building of the Nowrasjee Wadia Hospital at Parel, built and partly endowed by Sir Ness Wadia and his brother Mr. C. N. Wadia. By the kind permission of Dr. M. V. Mehta, the Principal Medical Officer, we have been permitted to attend the hospital and note the conditions of the mill-workers confined there. The number of the mill-working class who attend hospital are even now small, as they still prefer delivery in their *chawls* or villages, and for this reason we have kept the enquiry open until May 1929, during which time we investigated 576 cases of labour among women of the mill-working class. Of these 282 were women actually working in the mills, and 294 were the wives of male mill-workers living under the same social conditions as the first, but not employed in the mill.

With the kind permission of the Millowners Association and of the managers concerned, we visited a number of mills and saw the conditions under which the women worked. We were accompanied by Dr. T. J. Cama, who, as already stated, holds a special post as Factory Inspector under the Government of Bombay and who showed us several of the mill crèches and of the dispensaries officered by medical women

(4 in number). She also took us to see several of the most insanitary *chawls* available, for which we were duly grateful.

During the same period we have been watching the maternity conditions of women of other classes in the City, especially in the Cama and Allbless Hospital, to the successive Superintendents of which we are grateful for the facilities so kindly given. In many cases we watched the after progress of our patients by visiting them in their homes, either *chawls* or better class houses, and so gained much knowledge of the conditions under which the different communities live. We have also carried out some observations on the diet of the people.

Before entering on the special question of maternity conditions it may be well to make some remarks on the habits and ways of living of the women of the mill-working class.

(1) The *housing* is poor. The people live in *chawls* or large tenement houses, which are usually built with a long central passage from which rooms about 12 by 15 feet in area open on each side. The room may be occupied by one family, or, in order to save money on the rent, several families may share it. A case is described by Barnes(3) where 36 persons inhabited a room 12 by 15 feet. This is an extreme instance of overcrowding, but it is common to find 6 or 10 people inhabiting such a room, in which the women will also have their deliveries.

One of us personally investigated the homes of 20 women of the mill-working class and found that the average space at night per head was 240 cubic feet. A similar investigation was made of the homes of 70 women of the poorer non-industrial class and it was found that the cubic space at night worked out to 534 per head.

The rooms usually have a window opening on the street but the only other air space, the door, opens into the passage, not into the outer air. The one window may not open directly to the air, but into a verandah where the family cooking is done, so that the air which enters is contaminated with smoke. The window may be blocked by neighbouring buildings, so making the room close and dark. The housing question is improving and many new *chawls* are being built in the open areas to the north of the city. These are not yet fully occupied, but as they become more popular they should do good, especially if overcrowding within them can be prevented.

(2) *Sanitation* is water borne and there is a good drinking supply. In the newer *chawls* there is a tap in each passage and a room for bathing. Each *chawl* has a superintendent responsible to the owner for general order and cleanliness. In spite of this most *chawls* are dirty, the passages littered with rubbish and swarming with unwashed children. The rooms are often dirty and disorderly, but here and



occasional small quantities of fish or mutton. Milk and *ghi* were almost never taken, eggs never, and very little vegetable oil. Fruit was never taken—this may be different at the time when mangoes are cheap.

In the non-industrial classes more rice was taken and less *bajri*. If wheat was taken it was in small quantity. Milk and *ghi* were often taken and fairly large quantities of vegetable oil. Fruit was sometimes included in the diet, and either meat or fish was taken most days by non-vegetarians. White bread was sometimes taken and especially by Christians. Vegetables sometimes included tomatoes or greens, though in small quantity.

Table I shows the average diet of the 20 mill-workers as compared with the average diet of 70 of the poor non-industrial class. Included in the table is the blood count, the cubic space per head and the family income. It will be seen that the mill-workers were better caloric and had a higher proportion of carbohydrate than the hospital controls. Their diet was extraordinarily deficient in fat, and especially in animal fat, also animal protein.

The difference in the diets was probably due to the fact that the mill-workers, although the poorest community, were bound to have a good supply of calories or they could not have got through their work. Hence they bought the cheapest and most filling foods. They drew their vitamin A from *bajri* and *dal* of which they took a fair amount. Their vitamin B was from the same source and from the vegetables (which were not containers of vitamin A). Vitamin C was no doubt obtained to some extent from the vegetables, although these were cooked. There did not appear to be any source of vitamin D except the small bits of mutton rarely taken, but the women went out freely and no doubt sat in the sun and got a supply of vitamin D through the skin.

The vitamin A supply of the non-industrial class largely depended on milk and milk products, which, in Bombay at least, are doubtful containers. The mill-workers obtained their vitamin A supply from grain, which is a certain source.

Table I shows that when the vitamin A column was corrected to allow for the bad *ghi* the mill-workers had nearly as much vitamin A as the non-industrial class, while they had a slightly larger vitamin B intake.

These facts will be referred to later in connection with disease and mortality in child-birth.

(6) *Habits and work*.—Women of the industrial classes do not observe *purdah*. The women of Class B rise early as the men have to be at the mill by 7 a.m. They cook the food, then clean the cooking and eating vessels, do the family marketing and the family washing. Many carry their husband's dinner to the mill daily. Many take in boarders from among

the single men working, and cook their food and carry it to the mill. They have, of course, no servants, so they are forced into the open air each day and have fairly active lives.

Women of Class A work in the mills from 8 a.m. to 5-30 p.m. (sometimes longer) with an hour's interval at midday for food. They have the advantage of a walk to and from the mill, and sometimes a second walk at midday if they come home for their food. They spend their days in the big factory rooms, which are on the whole, clean, light and airy, at least as compared with most of the *chawls*. The joint income earned by themselves and their husbands should make better living possible and in some cases, no doubt, it does so, but the tendency of the men to gamble and drink too often leaves the family with nothing but the mother's wages for support. It is generally agreed that the women themselves never drink.

The women are employed chiefly in the winding and reeling departments. This is not heavy work. It entails standing before a frame, watching the yarn wind and removing and replacing it when finished. The attention must remain fixed on the bobbin throughout, as broken threads unnoticed spoil the yarn when it comes to weaving.

In some cases there is a mother-in-law or other female relative living with the family, who does the home cooking and housekeeping. In other cases the woman herself has to do it. This entails getting up at 5 or 5-30 a.m. to kindle the fire and cook the midday meal. At the midday interval she may come home to serve the food to husband and children. When work is finished in the evening she does her marketing and goes home to cook the evening meal. After it is eaten she has to do the cleaning up and various odd jobs about the house. Some women said they got up at 5-30 a.m. and did not get to bed till 10-30 p.m. working all the time. If there is a young baby and no one to leave it with save perhaps a little sister or a neighbour, it can be imagined how this must add to the woman's tasks and anxieties, and one cannot wonder that, not realizing the danger, she is so liable to dose it with opium. Out of 83 mills in Bombay City only 13 have crèches attached.

(7) *Age and caste*.—Of the mothers of Class A, 11 per cent. were below 20 years, 62 per cent. between 20 and 30 years, and 25 per cent. over 30 years. Only 2 were 15 or younger, the youngest being 14.

Of the mothers of Class B, 20 per cent. were below 20 years, 59 per cent. between 20 and 30 years and 20 per cent. over 30 years. Four were 15 or younger, the youngest being 14. In fact there were fewer very young mothers in Class A.

The great majority were Hindus, in Class A, all, except for 3 Christians and 3 Mahomedans; and in Class B all, except 7

Christians and 12 Mahomedans. This does not probably show the real proportions of these communities among the industrial classes, for Mahomedan women have a great objection to attending hospitals staffed by men (as is the case in the Nowrasjee Wadia Hospital) and as a matter of fact they went in small numbers to the Cama Hospital (staffed by women) and were not included in these figures.

*The effect of work on childbirth.*

1. *The mother.*—This question may first be studied by comparing the maternity conditions of industrial and non-industrial women.

carbohydrate and not fat, the content of which in the diet is extremely low. It has been shown McCarrison(6), Ederer(7), Harris and Moore(8) that the higher the fat content of the diet the greater the need for vitamin B in the diet, especially if the "A" content is low. It would seem as if the low fat intake and the relatively high vitamin B content of the diet placed the mill-workers in a relatively better position as regards diet than the non-industrial workers, whose diet, though more varied, richer in fats and better supplied with animal products, is yet not sufficiently rich in the essential vitamins to permit of the proper utilization of

TABLE II.  
*Labour cases seen in Bombay hospitals.*

	Community. 1925—1929.	OSTEOMALACIA.		ECLAMPSIA.		ANÆMIA.		MATERNAL MORTALITY.
		Number.	Rate per 1,000.	Number.	Rate per 1,000.	Number.	Rate per 1,000.	Rate per 1,000 births.
Non-industrial classes.	Hindu, 2,066 cases.	6	2.9	8	3.8	83	40.1	16 per 1,000 births.
	Mahomedan, 842 cases.	32	38	14	16.6	79	93.8	
	Christian, 801 cases.	nil	nil	3	3.7	39	48.6	
Industrial classes.	Mill-workers, 576 cases.	1	1.7	1	1.7	6	10.5	1.7 per 1,000 births.

The table shows that there is a marked difference between the maternity conditions of the two classes, the incidence of disease connected with pregnancy being much less in the industrial class. The maternal mortality is also much lower, only 1.7 per 1,000, which would be low for any country. It is possible that some deaths may have taken place after the patients left hospital, since they were discharged on the 8th or 10th day, but the same may be said about the women of the non-industrial class. The maternal mortality for the city of Bombay for the years 1926, 1927, and 1928, as reported by the Health Officer was 13.9, 9, and 9 per 1,000 births respectively. "Mill-workers" as shown in Table II includes both actual workers and non-workers (the wives of the male mill-workers) but there was no marked difference between the two classes so far as maternal disease or mortality was concerned.

The low maternal mortality among the mill-workers is of course due to the low incidence of the toxæmias and other diseases of pregnancy in this class. This immunity is probably directly associated with both the diet and the mode of life of these workers. The diet is well caloric but the calories come very largely from

these elements. The more active and open air life of the mill-workers must also be conducive to better health.

2. *The child.*—The infant birth weight is lower in the industrial than in the non-industrial class and the question arises why should this be so if the maternal conditions are better? The answer no doubt is that the mill-working class has a diet almost devoid of fat. During the last month or two of foetal life the principal change in the foetus is the deposition of fat under the skin. It is possible that the almost complete lack of fat in the mother's diet associated with a low vitamin content may be directly related to this failure to deposit fat in the foetus.

In addition there is the effect of work. The numbers which we have investigated are not sufficiently large to enable us to give a definite pronouncement on this question, but so far as they go they tend to show that although the mother is not prejudicially affected by work, her child is smaller than those of the non-workers and her stillbirth rate is higher.

Our evidence is based on the following:—

1. A comparison of the infant birth weight and the stillbirth rate in



TABLE III.

*Number of infants in different weight groups.*

Group.	No. of cases.	3 to 4 LBS.		4 to 5 LBS.		5 to 6 LBS.		6 to 7 LBS.		7 to 8 LBS.		8 to 9 LBS.		9 to 10 LBS.		Mean weight lbs.	Standard deviation.
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
A. Mill-workers	223	6	2.6	37	16.5	93	41.7	66	29.5	20	8.9	1	0.4	..	..	5.502	0.932
B. Wives	236	2	0.8	27	11.4	80	33.9	95	40.2	31	13.1	1	0.4	..	..	5.813	0.861
C. Non-industrial	518	7	1.3	32	6.1	140	27	198	38.2	122	23.5	13	2.5	4	0.7	6.095	0.982

9.3% of Class A, 13.5% of Class B and 27% of Class C were over 7 lbs. at birth.

TABLE IV.

*Number of infants in different weight groups.*

Group.	No. of cases.	3 to 4 LBS.		4 to 5 LBS.		5 to 6 LBS.		6 to 7 LBS.		7 to 8 LBS.		8 to 9 LBS.		9 to 10 LBS.		Mean weight lbs.	Standard deviation.
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
(a) Mill-workers prior to strike.	134	4	2.9	27	20.1	57	42.5	39	28.8	8	5.9	1	0.7	..	..	5.377	0.897
(b) Mill-workers during and after strike.	89	2	2.2	10	11.2	36	40.4	27	30.3	12	13.4	0	0	..	..	5.713	0.9125

6.7% of Class (a) and 13.4% of Class (b) were over 7 lbs. in weight.

- A. Women mill-workers (223).  
 B. Wives of male mill-workers, not themselves working (236).  
 2. A comparison of the same facts in  
 (a) Women mill-workers delivered between October 1925 and April 1928 (134). During this period work was being carried on regularly in the mills except for occasional short strikes.  
 (b) Women mill-workers delivered between May 1928 and April 1929 (89). During this time there was a six months' general strike from April to November, when the women workers had an enforced rest.

Table III shows the numbers of infants in different weight groups of A, B and C. It will be seen that in nearly every weight group B takes a place between Classes A and C.

Table IV shows the same numbers with regard to (a) the mill-workers up to the commencement of the general strike and (b) the mill-workers after the commencement of the strike and for the 6 months following. It will be seen that (b) has a smaller percentage in the lower weight groups and a larger percentage in the higher weight groups.

Table V shows the differences and significances of differences of the mean weights of the infants in the groups studied. In each case the differences are significant.

class (hospital) remained round about 100 per 1,000 during this period, excepting the Mahomedan community where it was much higher.

An effort was made to check the condition of the foetus further by comparing the proportion which the foetal weight bore to the maternal weight. The maternal and infant weights were taken in a series of groups, Hindu, Mahomedan, Christian (all of the hospital class), also mill-workers and mill-workers' wives. In none of the groups was any significant difference found in the percentage of the foetal to the maternal weight, with the single exception of the mill-workers. In this group the proportion which the child's weight bore to the mother's weight was significantly less than in the other groups. It is possible that this, as well as the absolute lowering of the child's weight, is associated with the lack of fat in the mother's diet which is of such a degree as is never seen in any class in Britain. (9)

To sum up we find that—

1. The infants of the industrial class have a significantly lower birth weight than those of the non-industrial class.

2. The infants of the workers have a lower birth weight than those of the non-workers in the industrial class, and this is emphasized by the fact that during the strike year when work for a large part of the year was not possible the infant birth weight of the worker class approximated to that of the non-workers.

TABLE V.

*Differences and significances of differences of mean percentage weights of infants in groups studied.*

	Standard group.	Group compared.	Difference of means.	Significance.
1. a.	Non-industrial class	Industrial class	-0.439 *	6.3 †
b.	"	Wives of mill-workers	-0.282	4.0
2. a.	Wives of mill-workers	All mill-workers	-0.311	3.75
b.	"	Mill-workers before strike	-0.436	4.44
3.	Mill-workers after strike	"	-0.336	2.70

\* Difference of the means.

† Difference of means divided by square root of the sum of the squares of the errors of the two means.

$\frac{M_1 - M_2}{\sqrt{E_1^2 + E_2^2}}$  If result 3 or more difference is taken as definitely significant: if between 2 and 3 as probably significant.

With reference to stillbirth it was found that Class A (mill-workers before the strike) had a stillbirth rate of 178 per 1,000 births, while that of Class B for the same period was only 86 per 1,000 births. During and following the strike the stillbirth rate of Class A fell to 98 per 1,000 while that of Class B rose slightly to 114 per 1,000. The stillbirth rate of the non-industrial

3. The stillbirth rate of the non-workers in the industrial class approximated to that of the non-industrial class. That of the workers was much higher, but during the strike year came down to the same or an even lower level than the others.

4. In the mill-worker group alone the infant birth weight was a significantly lower percentage

of the mother's weight than was the case in the group of Hindus taken as standard.

It appears probable, that a part of the foetal disability is due to the fat-deficient diet, also that work, at least under the conditions it is carried on in Bombay, is prejudicial to the foetus. It is easy to understand that the fat deficiency may not be so serious if the mother has a comparatively easy life and plenty of time to rest, and it is also likely that the work might not affect the child prejudicially if the mother had a reserve of fat on which it could draw during the later months of pregnancy. It is possibly the combination of these two factors which reduces the infant weight and increases the tendency to stillbirth.

There is some evidence pointing to the fact that the infants of workers who have to do their housework and the infants of mothers who go on working until nearly full time, suffer more than the others in respect to the disabilities given above, but this is not sufficiently substantiated to dwell upon.

An endeavour was made to contrast infant and child mortality in the industrial and non-industrial classes by asking each woman the number of her past confinements and the number of her surviving children: 500 consecutive women delivered in the Cama Hospital were so questioned and their replies were compared with those received from the 571 women of the industrial class, delivered in the Nowrasjee Wadia Hospital: 62 per cent. of the non-industrial children survived as compared with 43 per cent. of the industrial children.

*How can the conditions of women mill-workers be remedied in order to produce better conditions for the child?*

In considering this question we should try and dissociate our minds as far as possible from the conclusions already reached in Europe on this question. Conditions in Europe and India are very different. Women workers in India have special difficulties to contend with which should not be forgotten in endeavours made to ameliorate their circumstances. (1) There is greater poverty and a diet lacking in nutritive power. Hence the people have little reserve of strength. Many of the women workers begin to feel exhausted before pregnancy is far advanced, and give up work on this account, at the 5th, 6th or 7th month. If the maternity benefit is given on condition that the woman remains at work until the end of the 8th month, many will continue working when physically unable and the result will be worse than before. (2) The principles of maternity and child welfare are not understood among the people. Fathers do not realize their responsibility to the unborn child, nor, perhaps, does the mother herself. Hence if two months' salary were given to her, it would too often be used for the benefit of the family and especially of the husband. Even in England this is sometimes the

case. How much more likely to be so in India, where the mother not only occupies a lower position in the household, but has not the knowledge which would enable her to spend a maternity benefit wisely?

The following are suggestions as to how employers could mitigate the conditions of expectant mothers:—

(1) By providing light work during the later months of pregnancy, which the woman could do without standing.

(2) By providing one free meal a day or milk from a good source to expectant mothers during the last two months.

(3) By having a simple maternity home attached to the mill premises. Each mill should have a crèche for receiving young children while their mothers are at work. Even now crèches are attached to 13 of the Bombay mills. It would cost little to have one or two airy rooms attached to the crèche and either keep a midwife to attend to the women or allow their own *dai* to come and attend them. As compared with confinement in the *chawls* they would have space, fresh air, good food and rest from home duties; as compared with hospital, it would at least be adequate for normal labour and would probably be taken better advantage of than the hospitals, where comparatively few mill-workers go for delivery.

(4) As regards maternity benefits these would be probably best given in kind, as indicated above—free meals, accommodation for confinement, food during the period of confinement, and a money present when returning home, sufficient to allow the mother a month's rest after delivery.

But if a maternity benefit of two or three months' wages is to be given, let it not be dependent on the women remaining at work until the end of the 8th month and returning one month after delivery. If she has worked in the mill a full year, why should the benefit not be given her at any time of her pregnancy when she wishes to leave off work and without securing any promise for the resumption of work? It would thus be in the nature of a bonus for work done. Half would be given when she left off work and half when the child was born. If she is required to remain until the end of the 8th month, harm will ensue in many cases, while the condition that she must resume work a month after delivery will assuredly mean neglect of the baby unless she has a female relation at home to take charge of it or unless there is a mill crèche.

The benefit, in whatever shape, should be strictly dependent on the mother having a full examination by a woman doctor, not only in order that her pregnancy may be certified, but in order that any danger or abnormality may be seen and provided for. This would also allow of propaganda being carried on and instruction given in the proper use of the benefit.

A Bill has recently been passed by the Bombay Legislature requiring that maternity benefits should be paid to all women mill-workers at confinement, the benefit to consist of two months' wages, that is leave on full pay for a month before and a month after confinement. While welcoming the action, one cannot help regretting the form in which the benefit is given for the reasons already declared. The woman is handed a cash benefit and no effort is made to tell her why, or to ensure that her own health or the child's will be safeguarded. It is not impossible, even yet, to amend the proposals of the bill.

The benefit now provided by legislation is Rs. 21 per head. There are about 30,000 women mill-workers in Bombay, of whom it is estimated about 10 per cent. bear children annually. Thus the amount to be given by the mill industry towards the benefit (if all women eligible came forward, which is unlikely) would be about Rs. 60,000 annually. A proportion of this sum would be sufficient to finance a large enquiry on the lines given above and to obtain ample evidence as to the best method of giving maternity benefits in India. Surely such an enquiry would be a wise preliminary of any widespread scheme for maternity benefits.

In the course of our investigation we were impressed by the fact that improvement in the conditions of the male workers would in itself assist the maternity troubles of the women. The lack of proper nourishment in pregnancy and the need for continuing work when physically unable is often due to the habits of the men who spend their own wages on drink or gambling, so that the wife practically supports the household. The provision of cinemas or other amusements for Sundays and holidays, the starting of welfare organizations, propaganda to inculcate a sense of responsibility towards the wives and children would all be means to this end. Work of this kind is already being carried out by the Y. M. C. A. in Bombay, but our point is that it should be done by the employer for the benefit of the worker. Grain shops in the mills would ensure the workers getting a good return for their money, and schools for the workers' children would be specially useful as inculcating on impressionable minds a sense of greater responsibility both in regard to work and social relations.

In concluding, we wish to express our thanks to Dr. Lucy Wills for much help and advice, especially with regard to tables and to the facts about diet obtained in the course of a larger enquiry which she is carrying out.

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### A CLINICAL STUDY OF POST-KALA-AZAR DERMAL LEISHMANIASIS.

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EIGHT years ago Brahmachari (1922) reported a case, a man with nodular skin lesions all over the body in which leishmania had been demonstrated. This patient gave a history of having had kala-azar and of having been cured by a course of injections of sodium antimony tartrate. During the next year or two a few more single cases of a similar type were encountered and reported, one by the senior writer (Knowles, Napier and Das Gupta, 1923). From the latter half of the year 1925 onwards an increasing number of patients suffering from this condition have attended at the School of Tropical Medicine and Hygiene for diagnosis and treatment. Colonel Acton and the senior writer (Acton and Napier, 1927) published a paper describing three distinct clinical types and discussing the pathology of this condition; in this report they analysed 44 cases. Since the publication of this paper Brahmachari (1928) has described yet another clinical type.

Our reason for writing this paper is three-fold. During the last two and a half years we have seen, and have made and collected notes on, some 150 more patients suffering from this condition; these 150 cases include some previously undescribed clinical types; and, finally, we have realized the necessity of publishing further notes on this comparatively common condition with which the general practitioner in Bengal does not appear to be very familiar, if the diagnoses made before patients attend this institution are fair samples. Our previous paper was published in the *Indian Journal of Medical Research* and was probably not seen by a very large percentage of the readers of this *Gazette*. We propose to make this a purely clinical study.

### *Ætiology of post-kala-azar dermal leishmaniasis.*

The condition has so far only been observed in kala-azar endemic areas. In this School we have seen well over two hundred cases whereas only 3 or 4 other cases have been reported in the literature. One case has been reported from Assam and so far none from Madras, to mention the other two endemic areas in India. We believe that a few other cases have been diagnosed in Assam and in the series now being reported two of the patients came from that province.

Persons of all ages, both sexes and all classes of the community appear to be equally susceptible. Indians, Anglo-Indians, Armenians, and Europeans have suffered from the condition; no community seems to be immune.

The condition is a sequela of a generalized leishmania infection. The majority of the patients give a history of having suffered from—and of having received treatment for—kala-azar, others give a history of having suffered from a definite attack of fever and splenic enlargement, whilst a very small number give no history of any such attack. As there appears to be no clinical difference between the cases in which there was and those in which there was not a definite history of kala-azar, the conclusion that all of them have at some time or another suffered from a generalized leishmania infection which in some instances cleared up without treatment, and which in others gave rise to symptoms so mild that they were forgotten or even not noticed by the patient, appears to be justified.

The dermal lesions usually make their appearance from one to two years after all the signs and symptoms of the visceral infection have disappeared. We have heard of no case in which the dermal lesions developed during the primary visceral attack, but in three instances which have come to our notice the visceral disease appeared to relapse at a time when the patient was suffering from dermal lesions.\*

In every instance in which a thorough search is made *Leishmania donovani* can be demonstrated in the nodular lesions; in the depigmented patches the parasite cannot usually be found by means of a smear, but in a number of instances leishmania have been obtained from a culture of a skin snip from a purely depig-

mented lesion. There is little doubt that the parasite is *Leishmania donovani* and not one of the other species of the genus *Leishmania*; Das Gupta (1927) and others have demonstrated that when inoculated into mice the culture from a dermal lesion produces symptoms similar to those produced by the culture from a case of kala-azar.

Certain other points in the ætiology of the condition will be discussed later in this paper when the details of the present series of cases have been analysed.

*Description of the different lesions encountered in post-kala-azar dermal leishmaniasis.*

(1) *The depigmented area.*—A small partially depigmented area, varying in size from a pin-point (Plate I, fig. 1) to an extensive area occupying the whole of one aspect of a limb (Plate I, fig. 2), but usually about 1 centimetre in diameter. They commence as small pin-point areas and increase in size, not often to a greater size than 1 centimetre, so that they are usually discrete but occasionally they increase beyond this, coalesce, and produce the map-like appearance of Plate I, fig. 2. The depigmentation is not progressive so that complete depigmentation is not seen. At first the lesions are macular in type, but later become very slightly raised, the pre-nodular type of lesion. The anatomical distribution of these lesions is shown in the analysis of our cases, below.

*The erythema or butterfly rash.* (Plate I).—There is an erythema which varies in intensity in different individuals; in some it is very striking, in others noticeable only when attention is drawn to it. Though it is constantly present the patient will sometimes give a history that it is far more prominent after the face has been exposed to the sun. The distribution of this erythema is very constant, namely on the cheeks, the skin surfaces of the upper and lower lips, and the outer surfaces of the *alæ nasi*; occasionally it extends on to the tip and sides of the nose and the chin.

*The nodules* (Plate II, figs. 3 and 4).—These are soft granulomatous growths, yellowish-pink in colour, varying in size, but usually about the size of a split pea. The nodules may join and form plaques (Plate II, fig. 3). The skin over the nodule is thin and glossy, but shows no special susceptibility to break down and heals rapidly after a portion of it has been removed for diagnostic purposes. The nodules are painless, but there is no anaesthesia. They appear on all parts of the body but mostly on the face. The best idea of the frequency with which the nodules appear at different sites can be obtained from the analysis of the present series which is given below.

These three are the most common types of lesion; the rarer types are described below:—

*The verrucose type* (Plate II, fig. 5).—Warty growths occur at the root of the nails on the fingers and toes, and there is considerable thickening of the distal phalanges of the digits;

\* Recently Brahmachari and Banerjee (1929) have reported one such case. The patient was originally treated for kala-azar with sodium antimony tartrate by the senior writer, remained free from all symptoms of dermal leishmaniasis for 2 years, he then developed dermal lesions, and was given 3 courses of treatment, including one of urea-stibamine, without showing any improvement. He drifted away from our institution, he developed signs of visceral infection again and was then treated by Dr. Brahmachari. Again the signs of visceral disease disappeared, but the dermal lesions remained. He eventually responded to a very prolonged course of antimony injections; the photographs show him to be entirely free from nodular lesions on the face.

PLATE I.

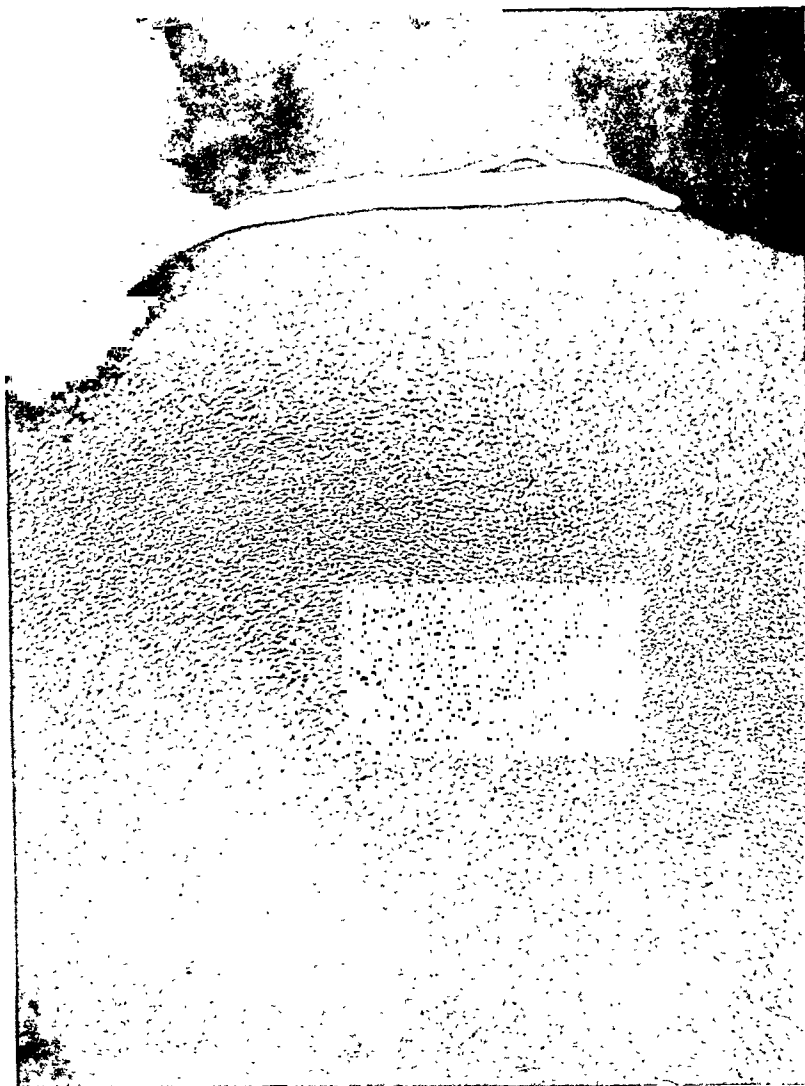


Fig. 1.



Fig. 2.



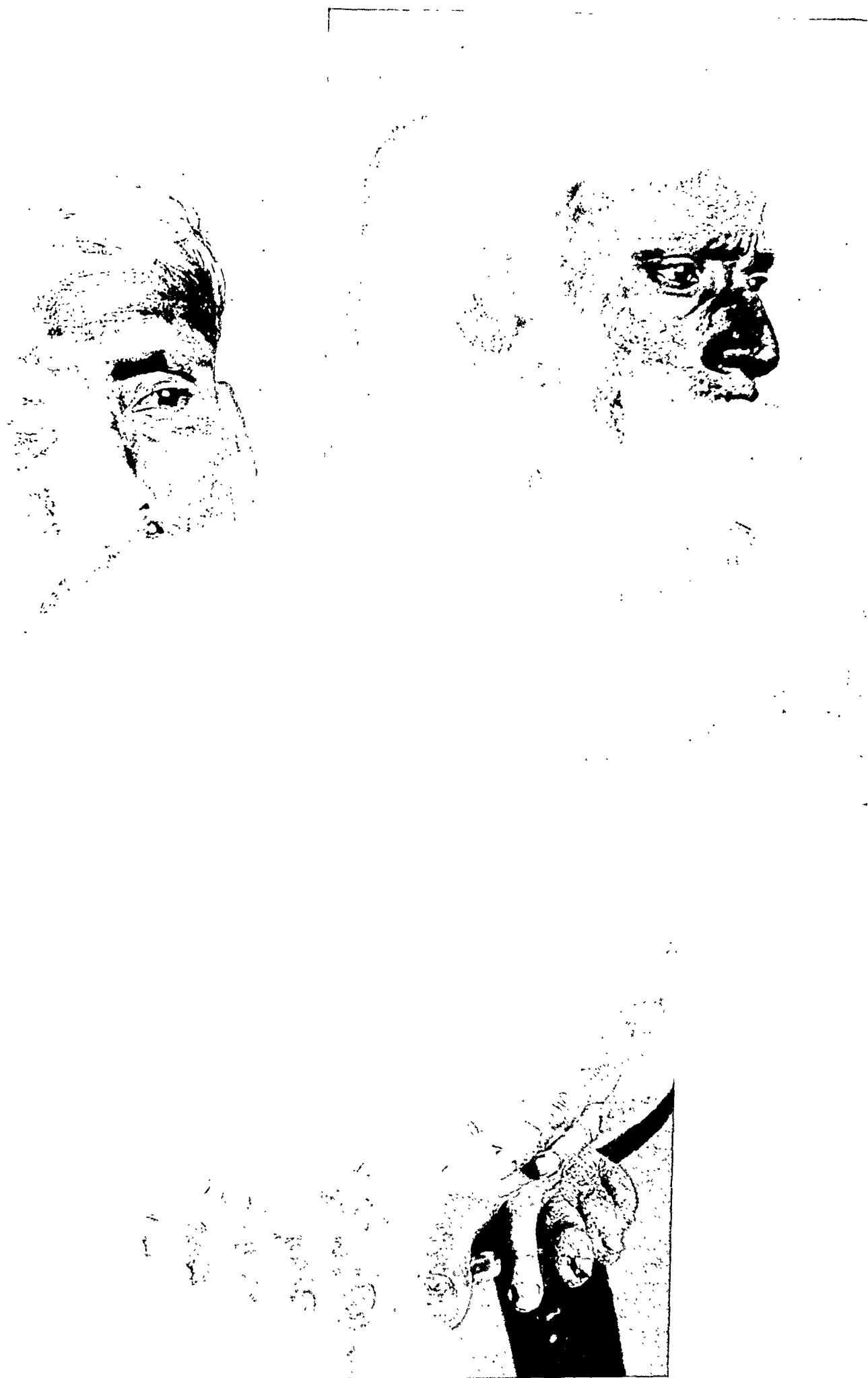


Fig. 5.

condition is usually diagnosed as a tubercle.

*The papillomatous type* (Plate III, fig. 6).—Instead of the ordinary nodular growth there is hypertrophy of the individual papillae of the skin with the production of a rough, dry area consisting of minute papillomatous growths. This is usually seen on the nose or chin.

*The hypertrophic type*.—In this the lips, eyes, or alae nasi become hypertrophied as if there were lymphatic obstruction of the part. They form soft lipoma-like swellings which do not pit on pressure (Plate III, figs. 7 and 8). In one variety of this type the nose is involved; there is a general hypertrophy of the tip of the nose, the skin is stretched and the tumour presents a mottled appearance like a gooseberry (Plate IV, figs. 9 and 10). In the sites where this particular type of lesion occurs the mucous membrane is continuous with the skin and the former appears to be involved in the infection. In the case shown in Plate III, fig. 7, the parasites were obtained for a scraping from the mucous surface of the lip and in the case shown in Plate IV, fig. 9, in a smear from inside the nose.

*The xanthoma type*.—The lesions present the textbook description of those of xanthoma tuberosum multiplex. There are raised orange-coloured plaques on different parts of the body, most noticeably at the bend of the elbow, on the axillary folds, on the inner side of the thigh, at the outer canthus of the eye, on the chin and at the angles of the mouth. They are painless and do not ulcerate. In a type of the disease which might be classed under this heading there are large raised plaques on different parts of the body which do not undergo the same colour change, but which become completely depigmented.

*The relationship of the different types of lesion.*

As far as the trunk and limbs are concerned the depigmented patches are the first to make their appearance. These patches tend to increase in size and in some situations they are replaced by nodules. Although depigmented lesions are very common on certain parts of the body below the neck—the back, arms, forearms and thighs—nodules are extremely rare; it seems obvious, therefore, that in these situations the depigmented areas seldom go on to nodular formation, but remain without undergoing any change for a considerable time. These lesions appear usually about one year after the kala-azar attack, but in some cases the interval appears to have been longer; this can be explained partly by lack of observation on the part of the patient.

On the face depigmented patches are frequently the first manifestation but occasionally these are preceded or accompanied by the butterfly erythema referred to above. When this erythema disappears it may leave scattered nodules or depigmented patches, usually both.

The erythema and the depigmented patches may be considered as the first stage of the disease, the nodular the second stage.

The nodular lesions appear on an average about two years after the kala-azar attack—they are usually preceded by depigmented patches or the erythematous rash, but are sometimes the primary lesions. A few patients have returned within a year of treatment for kala-azar with an extensive nodular eruption.

The xanthoma stage would appear to be the final outcome of this condition, but the comparative rarity of this type suggests that only a small percentage of cases go on to this stage. The history in these cases is usually from 10 to 30 years.

The other types described are probably not stages in the disease so much as special manifestations due to the particular anatomical distribution of the foci of infection; the verrucose type occurs in the terminal phalanges of the digits, the hypertrophic in the eyelids, lips, etc.

### Diagnosis.

The depigmented lesion and the nodule are so typical that after a very little experience they are easily recognized clinically. It is not easy to find the parasite in the depigmented lesions, in fact we have never yet seen the parasite in a smear made from one of these lesions, but by snipping out a piece of skin and dropping it into an N.N.N. tube, under strict aseptic precautions, a culture can usually be obtained. The confirmation of the diagnosis of a nodular lesion is much simpler; a portion of a nodule is cut off with a pair of scissors and a smear made from the cut surface, the smear is stained by Leishman's or Giemsa's stain and leishmania parasites are usually found without difficulty. In some nodules the parasites are scanty and a prolonged search may be necessary. The atypical lesions can only be diagnosed by finding the parasite.

### The present series.

This series consists of 150 cases. The patients attended for treatment at the Calcutta School of Tropical Medicine between October 1927 and February 1930, a period of about 28 months. The previous paper on this subject, referred to above, was submitted for publication in March 1927; it was a report on 44 cases. Between March and October a number of patients attended, but as the senior writer was on leave no special notes were kept.

### The presence of parasites.

In most of the nodular cases an attempt was made to confirm the diagnosis microscopically; in some, however, in which nodules were scanty, even though the first smear did not show parasites, if the condition was clinically typical, the clinical diagnosis was accepted. In a few of the cases in which depigmented patches

were present, the diagnosis was confirmed by cultural methods, but this was not done as a general rule. There is little likelihood of mistakes having been made on this account as the condition is so characteristic and the few cases in which there was any doubt were excluded.

Leishmania was demonstrated in 81 cases and in 69 the diagnosis was clinical only. We have divided the cases into two groups. A, being those diagnosed microscopically and B, those diagnosed clinically. It will be seen that these two groups are in every way similar and it is, therefore, almost certain that the aetiology in the clinically diagnosed group is the same as in the other.

#### *Nature of the lesions.*

The cases can be classified as follows:—

#### *The distribution of the lesions.*

A. In 15 cases there were nodules on the trunk or limb, in 63 nodules on the face and depigmented patches on the body, and in 1 nodules on the face only.

B. In 3 cases there were nodules on the trunk or limbs, and in 28 on the face only.

The distribution of the lesions on the various parts of the body is shown in the following table (Table II):—

It is thus apparent that nodules are the more common lesions above the shoulders, and the depigmented spots below. The nose, chin and cheek are the usual sites for the nodules, whereas the depigmented patches are found on the back, arms, forearms and thighs, a little less frequently on the chest, legs, shoulders and

TABLE I.

	A. (Leishmania present).	B. (Leishmania not demonstrated).	Total.
Mixed lesions, nodules <i>plus</i> other lesions .. ..	75	31	106
Nodules only .. ..	4	..	4
Depigmentation and erythema .. ..	1	12	13
Depigmentation only .. ..	1	26	27
<b>Total</b> ..	<b>81</b>	<b>69</b>	<b>150</b>

The other types of lesion were always associated with nodules; the verrucose was observed in 2 cases, the papillomatous in 2, the hypertrophic in 3, and a modified xanthoma type in 2. The butterfly erythema was observed altogether in 26 cases.

axillary folds, and rarely on the nose, ears and feet.

*History of prior attack of kala-azar.*—About 80 per cent. of the patients gave a history of a definite attack of kala-azar for which treatment had been given, others gave a history of a

TABLE II.

	LEISHMANIA PRESENT.		LEISHMANIA NOT DEMONSTRATED.		TOTAL.	
	Nodules.	Depigmented areas.	Nodules.	Depigmented areas.	Nodules.	Depigmented areas.
Forehead ..	31	12	8	18	39	30
Nose ..	62	2	17	8	79	10
Lips ..	33	5	4	14	37	19
Ears ..	15	..	4	1	19	1
Cheek ..	49	16	13	33	62	49
Chin ..	70	8	19	34	89	42
Shoulder ..	5	32	..	34	5	66
Chest ..	5	43	2	37	7	80
Back ..	7	52	1	51	8	103
Axillary folds ..	6	29	..	31	6	60
Arm ..	8	51	..	51	9	102
Forearm ..	10	48	1	51	11	99
Hand ..	5	12	0	10	5	22
Abdomen ..	4	24	0	32	4	56
Thigh ..	6	50	1	49	7	99
Leg ..	5	35	1	37	6	72
Foot ..	5	7	..	5	5	12

febrile attack with splenic enlargement, but a very few gave no history of fever at all. The table below gives further details of the histories:—

TABLE III.

	Cases in which leishmania was found.	Cases in which leishmania was not demonstrated.
History of kala-azar and treatment thereof.	63	56
History of a febrile attack and splenic enlargement.	11	11
No history of any febrile attack.	7	2
<b>TOTAL ..</b>	<b>81</b>	<b>69</b>
Percentage giving no history of kala-azar.	22.2	18.8

Excluding one case in which the history was 36 years, the average lapse of time between the attack of kala-azar and the first attendance for the dermal condition was 3.45 years in the cases showing nodules and 3.28 in those with only depigmented patches. There is very little difference between these two figures; this suggests that the depigmented patches do not by any means always develop into nodules.

*The incubation period.*—In kala-azar the parasites are distributed widely and can be found in practically every tissue and organ in the body, but for some reason even in chronic cases of the disease no development in the skin sufficient to produce local lesions appears to take place. Presumably, therefore, this development commences when the visceral infection disappears. For those cases in which a history was obtained the time that elapsed between the conclusion of treatment for kala-azar and the first observation of the skin lesions is shown in the following table:—

This is also shown graphically in Graph I.

The mean of the lapse of time between the disappearance of the symptoms of visceral leishmaniasis and the appearance of the lesions of dermal leishmaniasis is 1.88 years. It must be remembered that a large number of the patients will not have noticed the early lesions so that the actual time is probably less than these figures indicate. In 88 per cent. of patients the lesions appeared within three years of the kala-azar attack.

#### *The relationship to treatment.*

The majority of the patients gave a clear history regarding the treatment they had received, but a few could only state that the injections were "white, like water," or "red," as the case might be. These were entered as sodium antimony tartrate or urea stibamine, respectively. The following table gives details of the treatment which the patients had received (Table V):—

Of the 112 patients who had received treatment 2 had definitely received an insufficient number of injections, and 24 had received less than the usual course, but sufficient to produce a 70 or 80 per cent. cure rate. As a very large percentage of patients fail to complete their course of treatment, there is nothing in these figures which suggests that insufficient treatment is a predisposing factor in the production of skin lesions.

#### *Caste, sex and age.*

The following table shows the caste and sex of the patients (Table VI):—

The sex distribution is very much that of the general out-patient attendance. In an analysis of 300 kala-azar out-patients (Napier, 1922) the total number of females was 45; this is almost exactly the proportion of females in this series.

#### *Age distribution.*

This is shown in tabular form below (Table VII):—

There is a very marked difference in the age distribution between those showing nodular

TABLE IV.

Period that elapsed between conclusion of treatment for kala-azar and first signs of dermal condition (roughly, to nearest year).	NUMBER OF CASES IN EACH GROUP.		
	Those showing depigmented lesions only at present.	Nodular lesions.	All cases.
Less than one year .. .. .	4	13	17
One year .. .. .	10	27	37
Two years .. .. .	8	26	34
Three " .. .. .	6	8	14
Four " .. .. .	2	7	9
Five " .. .. .	1	2	3
Six " .. .. .	..	2	2
	<b>31</b>	<b>85</b>	<b>116</b>

87.9%

TABLE V.

Nature of treatment.				Cases with only depigmented lesions.	Cases with nodular lesions.	All cases.
Sodium antimony tartrate	..	..	..	17	33	50
Urea-stibamine, or other pentavalent compound	..	..	..	13	38	51
Mixed treatment	..	..	..	1	10	11
				31	81	112
(Treated at the School of Tropical Medicine.)						
Sodium antimony tartrate	..	..	..	5	5	10
Urea-stibamine	..	..	..	1	1	2
Neostibosan	..	..	..	1	2	3
				7	8	15

TABLE VI.

Caste and sex.				Nodular.		Depigmented only.		All cases.	
Hindu, male	..	..	..	64	..	22	..	86	..
" female	..	..	..	..	4	..	3	..	7
Mohamedan, male	..	..	..	31	..	4	..	35	..
" female	..	..	..	..	3	..	1	..	4
European or Anglo-Indian, male	..	..	..	2	..	1	..	3	..
" female	..	..	..	..	4	..	2	..	6
Indian Christian, male	..	..	..	2	..	1	..	3	..
" " female	..	..	..	..	2	..	4	..	6
TOTALS	..	..	..	male 99,	female 13	male 28,	female 10	male 127,	female 23

TABLE VII.

Age group.	NODULAR.		DEPIGMENTED ONLY.		TOTAL.		GENERAL.
	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.	Kala-azar attendance.
Less than 10 years	1	0.95	3	8.11	4	2.82	21.1%
10, but less than 20	18	17.14	21	56.76	39	27.47	41.1%
20, but less than 30	43	40.95	12	32.43	55	38.73	22.6%
30, but less than 40	30	28.57	1	2.70	31	21.83	10.0%
40, but less than 50	12	11.41	..	..	12	8.45	5.2%
50, or over	1	0.95	..	..	1	0.7	

lesions and those showing depigmented lesions only; whereas 40 per cent. of the former are over the age of 30, only 1 patient or 2.7 per cent. of the latter are above this age. This is well shown in Graph II. Comparing the age grouping with that of the kala-azar patients attending the same institution, it will be seen that the dermal lesions are relatively much

more common in the later age periods; of the kala-azar patients 21 per cent. are in the first decennial period, whereas only 2.8 per cent. of the dermal cases fall in this period. Graph III shows the difference between the age grouping in the two conditions. The dermal leishmaniasis curve appears to be about 10 years behind the kala-azar curve. This cannot be accounted



Fig. 6.



Fig. 7.







Fig. 9.



Fig. 10.

for by the delay in development of the dermal lesions as the average is only about 2 years. It is obvious that as the age advances the patient becomes more liable to develop dermal lesions.

#### Discussion.

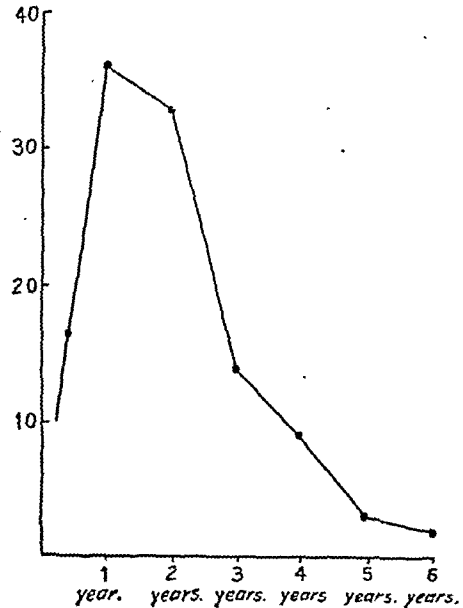
There is a considerable diversity in the type of skin lesion produced by this parasite—a number have been described and it seems very probable that many have not yet been recognized. The butterfly erythema was described by Dr. Brahmachari who thought that it was a manifestation of dermal infection with leishmania, because in the case he described it was associated with nodular lesions in which he was able to demonstrate the parasite, but the proof that his surmise was correct is provided in the analysis of this series of cases where this particular type of lesion is shown to be associated repeatedly with other dermal lesions caused by leishmania. On the other hand of the case in which the verrucose lesions were present one was diagnosed as dermal leishmaniasis on account of lesions in the face—the other lesions on the feet and fingers being diagnosed as tuberculides; it was almost by chance that the latter lesions were examined and also found to contain enormous numbers of leishmania. In the same way the diagnosis in the case shown in Plate III, fig. 7, was made during a routine examination of a cutting, and in the case of the girl in Plate IV, fig. 9, Dr. J. M. Henderson found leishmania in a smear made from her nasal mucous membrane which he was examining for lepra bacilli. Nevertheless, the typical lesions in this condition are so characteristic and the cases are, comparatively speaking, so common that it is still a matter of the greatest surprise why they were overlooked for so long and why they are so rare or, at any rate, so rarely reported in other kala-azar endemic areas.

The constant association of this condition with a history of kala-azar, together with the presence of the parasites morphologically and culturally identical with those of kala-azar, has led to the assumption that the dermal condition is a sequel of kala-azar. The only other explanation which seems at all possible is that the skin condition is caused by a subsequent infection with leishmania in a patient who has already acquired a degree of immunity to systemic infection. The widespread nature of the lesions and the fact that they appear so constantly in covered parts of the body make it certain that in the genesis of the condition there must at some time have been a generalized infection. In this series 80 per cent. give a history of a previous attack of kala-azar, whereas in the previous smaller series only about 50 per cent. gave this history. Graph I shows that there is a very definite association between the kala-azar attack and the onset of the dermal lesions, the peak of the curve being

at the first and second year. The lesions develop slowly, and it is quite comprehensible that, commencing when the generalized infection subsides, they would take this length of time to become clinically noticeable, whereas it is difficult to understand why, if it is a case of reinfection, this should occur at so constant an interval after the primary kala-azar attack.

GRAPH I.

Time between kala-azar attack and onset of symptoms of dermal leishmaniasis.



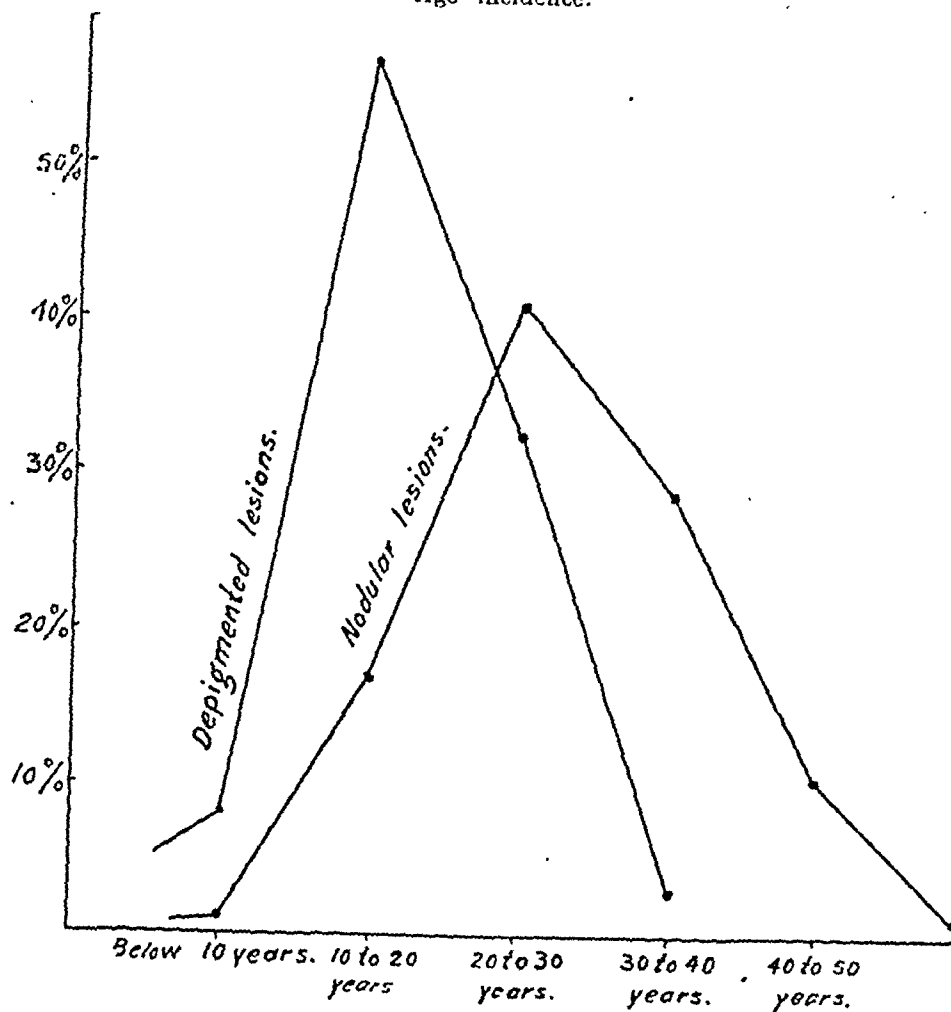
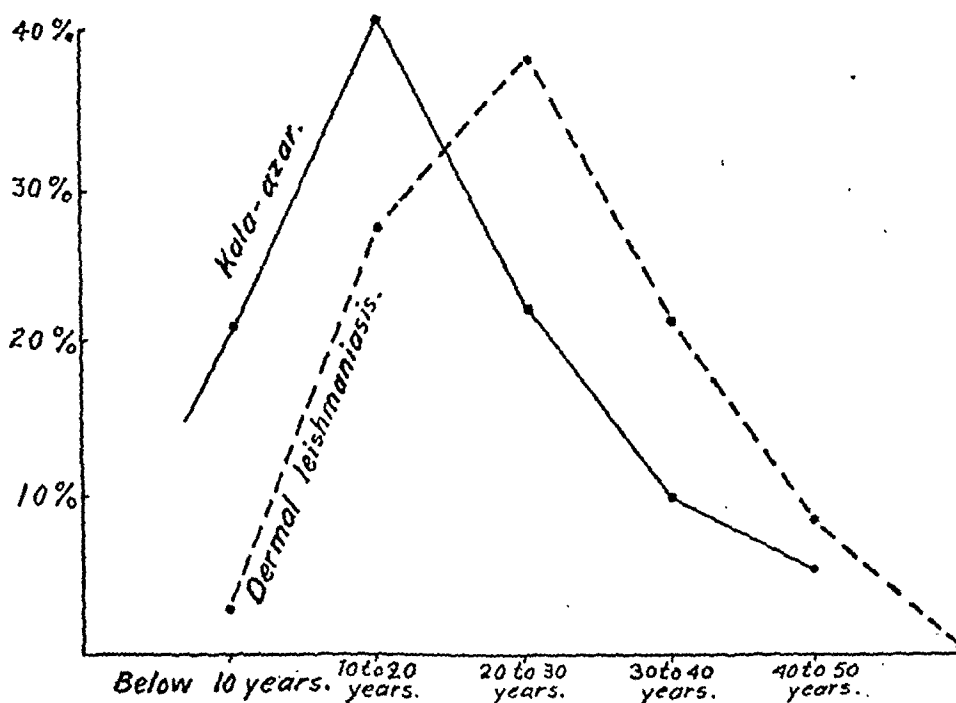
There is no evidence whatsoever that the treatment plays any part in causing this condition to develop in a kala-azar patient. The condition occurs in persons who give a typical history of an attack of kala-azar but who had no treatment for the disease, no one form of treatment appears to produce any special susceptibility towards the disease, nor is there much evidence that insufficient treatment is a predisposing factor.

In this analysis only one point regarding the epidemiology of the disease has come out—that is the later age incidence of dermal leishmaniasis as compared to kala-azar and the marked difference between the age incidence of the nodular and that of the depigmented lesions (Graphs II and III).

#### Acknowledgments.

A very large percentage of the cases in this series were sent on to us from either the Skin Disease Out-Patient Department or the Leprosy Department of this School. We take this opportunity of thanking the officers in these departments for the assistance they have thus rendered us.

Our thanks are also due to Dr. A. Basu for some help in note taking and smear examination.

GRAPH II.  
Age incidence.GRAPH III.  
Age incidence.

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## THE DIFFERENTIAL DIAGNOSIS OF LEPROSY AND DERMAL LEISHMANIASIS.

By E. MUIR, ch.b. (Edin.), F.R.C.S. (Edin.),

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DERMAL LEISHMANIASIS was first described by Brahmachari (1922) and later in more detail by Acton and Napier (1927). The first case described by Acton and Napier in their paper was originally brought to the leprosy clinic at the Calcutta School of Tropical Medicine under the supposition that he was suffering from leprosy. Since then patients suffering from this disease have frequently been sent to the leprosy clinic. Up to the end of 1928 the number of these patients was not recorded, but thereafter an accurate record was kept, and it was found that during the first 10 months of 1929 nine such cases appeared, while during November no fewer than five supposed cases of leprosy were diagnosed as suffering from dermal leishmaniasis. Out of these fourteen cases we found *L. donovani* in the skin of eight cases, while in the remaining six the diagnosis was made from clinical signs.

In three cases, seen previous to 1928, both leprosy and dermal leishmaniasis were present at the same time.

There are two types of dermal leishmaniasis lesions which are apt to be confused with corresponding leprosy lesions:

(1) Depigmented skin areas. In early cases of leprosy, especially in children, depigmented patches often appear, which are bacteriologically negative and without any definite signs of anaesthesia that can be detected. Such cases are diagnosed only because of a very definite history of contact with an infectious parent, or by the lesions taking on subsequently more definite signs of leprosy. It is this type of lesion from which the depigmented areas of dermal leishmaniasis have to be distinguished. In leprosy the areas are larger and fewer in number; and show signs of growth at the margin, which however fades more gradually into the surrounding dark skin than it does in the other disease. They tend to be situated more on the extensor surfaces of the body.

In dermal leishmaniasis on the other hand the depigmented areas are smaller and often punctate. They are more numerous and tend to cluster round certain areas such as the nose, mouth, chin, the inner sides of the thighs and

the shoulders and scapular regions. The margin is somewhat more clearly defined than in leprosy. The skin of this type of lesion is not generally positive for *L. donovani*.

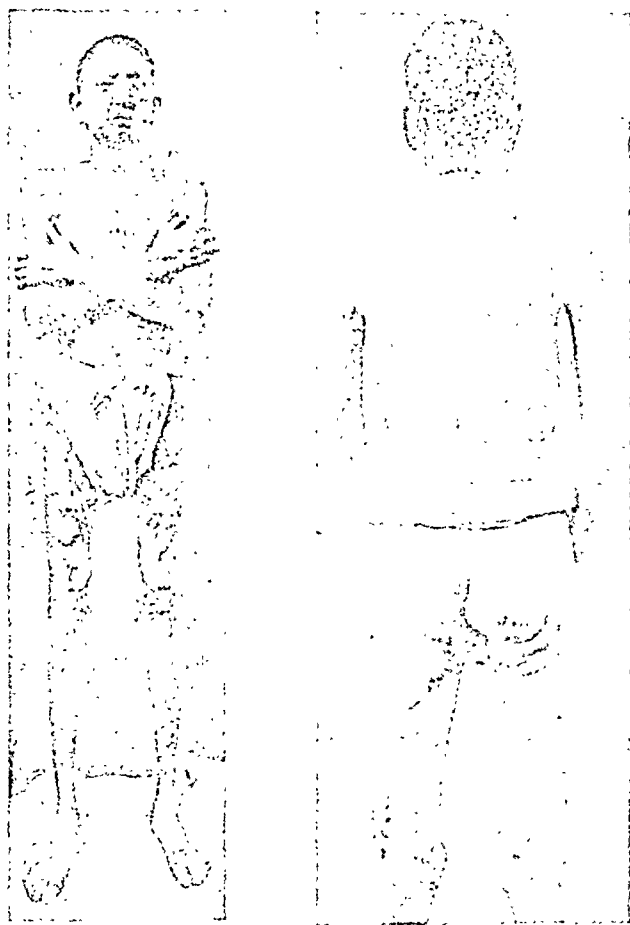
(2) The nodular type of dermal leishmaniasis (called the "xanthoma" type by Acton and Napier) has been even more frequently mistaken for the nodular type of leprosy. The lesions are similar in distribution, but have a like tendency to group themselves round the nose and mouth, only that in the former disease the ears are comparatively exempt, whereas in leprosy, when the nose and mouth are thickened or nodular, the ears also are almost invariably thickened and nodular also. The differential diagnosis in this type of lesion is not difficult to make, as in leprosy large numbers of acid-fast bacilli are present, while in leishmania *L. donovani* can generally be found in a smear. In the latter disease another useful diagnostic point which is generally present is a history of kala-azar having occurred a few years before.



Fig. 1. Dermal leishmaniasis.

Photographs are given of a patient who for 35 years suffered all the mental distress which the social ostracism of leprosy implies. When 10 years of age he suffered from a severe attack of fever, and this was followed by the appearance of depigmented patches which later became red and thickened. The patient was brought as a case of leprosy for consultation, and the

writer at first sight was inclined to confirm the diagnosis. But the comparative freedom of the ears from nodulation, the fact that the lesions of the arms were on the flexor and not on the extensor surfaces, and the absence from



Figs. 2 and 3. Front and back views of the patient shown in Fig. 1.

the hands and feet of all signs of anæsthesia, which would certainly have been present if this case had been one of leprosy, threw doubt on this diagnosis. Microscopic examination of a smear made from one of the nodules, instead of showing acid-fast bacilli, showed great numbers of *L. donovani*.

As the dermal form of kala-azar yields almost as readily as the visceral form yields to antimony treatment, the unnecessary distress suffered by this patient has provoked the writing of this paper. It is not unlikely that in the endemic areas of kala-azar many other patients are being treated for leprosy, or suffering, untreated, under its stigma, who might be relieved and rapidly cured if a correct diagnosis were made.

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#### A NEW CASE OF *BERTIELLA STUDERI*\* IN A HUMAN BEING.

By P. A. MAPLESTONE, D.S.O., M.B., Ch.B., D.T.M.  
 (From the Hookworm Research Laboratory, Calcutta School of Tropical Medicine and Hygiene, supported by the Indian Jute Mills Association.)

A PORTION of a tapeworm was sent by Capt. N. N. Ghosh of Naryanganj for identification. The history was that a boy eight years of age had been passing similar bodies at intervals of a week or so for some time past. The specimen consisted 14 segments of a tapeworm and it was 8 mm. in length and 10 mm. in breadth. It was fully gravid and all organs except the uterus, loaded with eggs, had disappeared. Eggs removed from the specimen had the appearance of the eggs of *Bertiella studeri* and their dimensions corresponded with those given by Chandler (1925) for the eggs of this species.

At the request of the writer Capt. Ghosh treated the patient with Ext. Filix Mas and almost the complete worm was recovered. It measured 28.9 cm. in length, and the posterior 4 cm. were 14 mm. in breadth. The head was not found in the bottle in which it was forwarded, but a small piece from the anterior end of the strobila consisting of seventeen segments was detached from the worm, so it is possible that the head was there also, but had been lost.

Mature segments were well extended, being 1.45 mm. in length and 3 mm. in breadth. The dimensions of this part of *B. studeri* given by Faust (1929) are 0.075 mm. in length and 6 mm. in breadth. At first sight these measurements appear very different, but any one who has observed a living tapeworm must be familiar with the great alterations in shape that these worms are able to produce in themselves by alternate contraction and relaxation of the transverse and longitudinal muscle fibres, so that length and breadth of segments alone are very unreliable as a diagnostic character. If the surface area of the mature segments of the writer's specimen are worked out by multiplying the length by the breadth it gives a figure of 4.35 square millimetres, and if Faust's measurements are treated in the same way an area of 4.5 square millimetres is obtained, dimensions which are closely comparable. From this observation it is suggested that possibly a more reliable guide in the diagnosis of Cestodes would be to give the surface area of a segment in square millimetres instead of its length and breadth.

On account of the longitudinal extension of the worm the sexual organs have a slightly different appearance from that figured for *B. studeri*, where the marked lateral extension and consequent longitudinal shortening of the segments compresses the ovaries laterally and shortens them antero-posteriorly. But if

\* Baylis (1929) gives *B. satyri* as a synonym of *B. studeri*, and the writer has followed this nomenclature in the present paper.



Fig. 1. Photograph of worm.  $\times \frac{3}{4}$ .

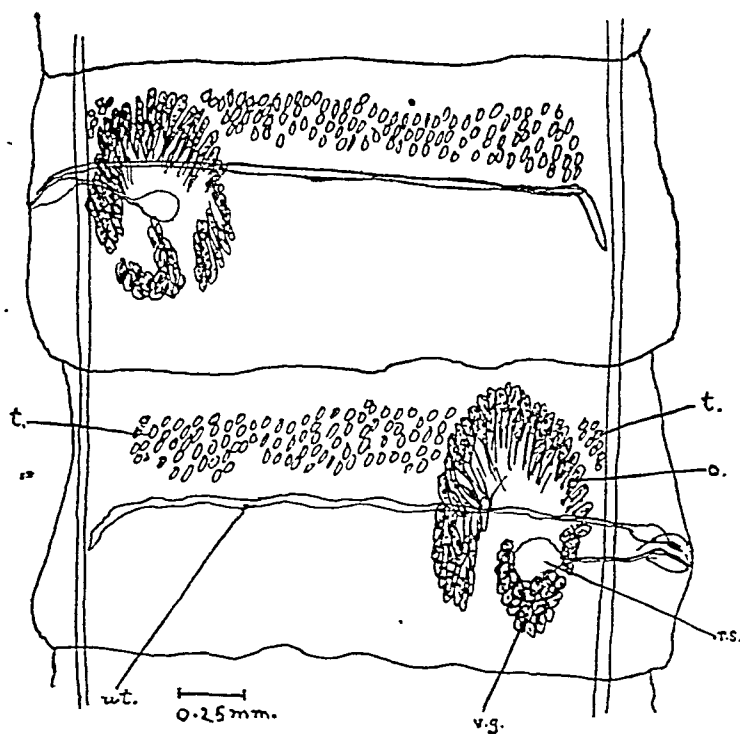


Fig. 2. Mature segments. o, ovary, r. s. receptaculum seminis, t. testes, ut. uterus, v. g. vitelline gland



allowance is made for the more extended condition of the writer's material these organs have the characters of *B. studeri*. The testes are approximately the same number, and the vagina, cirrus pouch and vas deferens appear the same. A further point of similarity is that the gravid segments are identical and the eggs are the same size as in *B. studeri*. Therefore, although the head was not obtained, it is considered there is little doubt that the writer's specimen is one of *B. studeri*.

Two previous records of this species of worm from human beings are in existence.\* The first is by Blanchard (1913) who obtained a specimen from a girl aged eight years at Port Louis, Mauritius, and the second record is by Chandler (1925) who obtained his specimen from a female Hindu child aged two years in Bengal. It is of interest that all three records are from young children. The only other record of a member of this genus being found in a human being is that of Cram (1928) who identified a worm as *B. mucronata*, which had been passed by a young Spaniard in Cuba.

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#### A NOTE ON AN APPARATUS DESIGNED TO TAKE SAMPLES OF WATERS FROM WELLS, TANKS, ETC., AT STATED DEPTHS.

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Epidemiologist to Government, Punjab,

and

PT. DAULAT RAM,

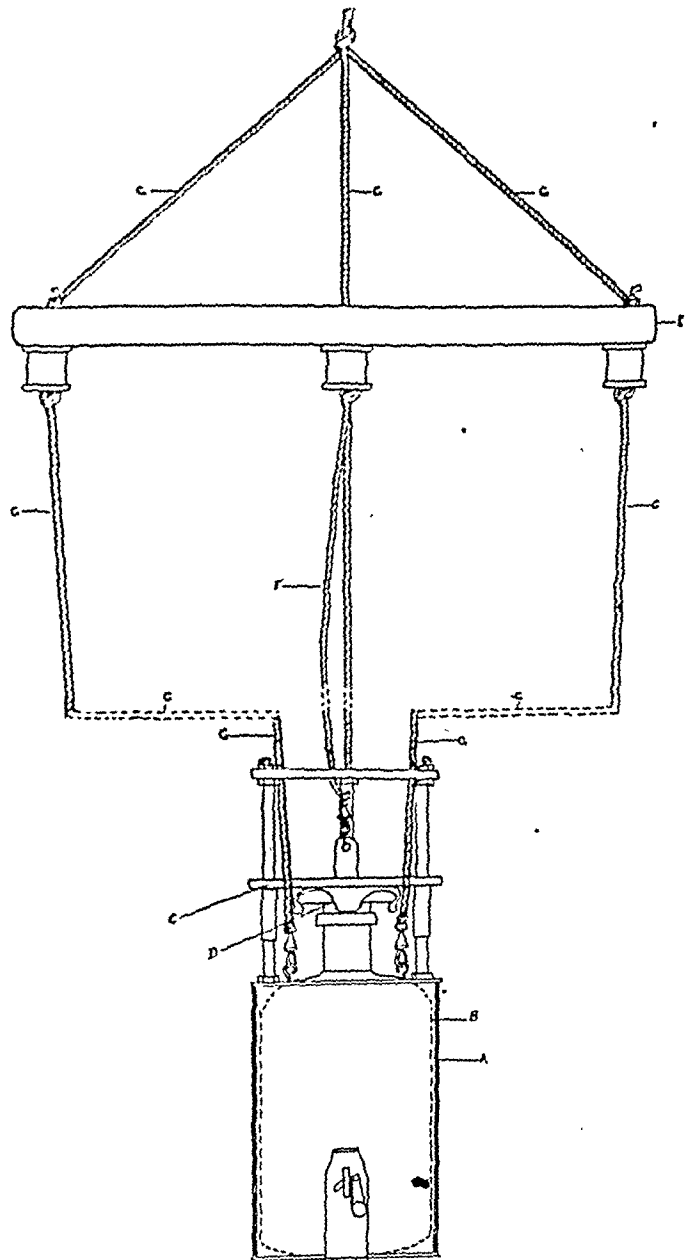
First Laboratory Assistant.

(From the Epidemiological Bureau, Punjab, Lahore.)

It is generally recognized that the surface water from a well or tank is not a fair sample of the average quality of its water. It is, therefore, of considerable importance, especially when taking samples for bacteriological examination to obtain water from a depth of about 3 feet from the surface and to avoid contamination from the upper layers. Various apparatuses have been designed for this purpose,

some of which require evacuated sealed flasks, while others involve complicated rubber connections and are, therefore, not suited for general use in this country. Moreover, in almost all the apparatuses described in the textbooks, there is no arrangement to close the opening through which the water enters the bottle or the flask when it is withdrawn, and there is no absolute surety of the container getting completely filled at the required depth. There is, therefore, a certain amount of risk of contamination from the surface water when the apparatus is withdrawn.

A simple apparatus has been designed for this purpose and is described below.



It consists essentially of four parts (see diagram).

(1) A cylindrical copper case A for the body of the bottle B. The bottom of the case can be opened on a hinge to admit the bottle and there is a circular hole in the top to allow the passage of the neck of the bottle and the stopper. Around the hole there are three hooks to afford attachment to the three suspending cords and in between them are fixed vertically three metal bars each about 3 inches long which could be joined together by means of a triangular piece.

\* After this paper went to press a paper appeared in *The Indian Medical Gazette* of April by Major Sharma, I.M.S., in which he records the finding of the eggs of *Bertiella satyri* in three out of 503 people examined at Shillong.—Ed., I.M.G.

(2) *A stopper holder C.*—This is a triangular piece of copper plate with truncated angles. It has a clip D to hold the stopper on its under surface, and a metal rod fixed in the centre on its upper surface. The latter affords attachment to the central cord and gives additional weight to the stopper. In the angles there are three holes guarded by tubes to receive the vertical metal bars.

(3) *A stopper float E.*—This is a wooden disc about three-quarters of an inch thick and a foot in diameter. There is a hook on its under surface, for the other end of the central cord and three holes at equal distance from each other near the periphery to allow free passage to the three suspending cords. Small reels are provided to wind up the cords when the apparatus is not in use.

(4) *System of cords.*—There are four of these, one a central cord F which is attached at its upper end to the hook in the float and at its lower end to the central bar of the stopper holder. Then there are three suspending cords G. These are attached to the hooks in the upper surface of the cylinder at their lower end and are joined together at the upper end after passing through the holes in the stopper float. They have knots below these holes on which the float can rest. Their lengths are so adjusted that when the float is resting on the knots, the central cord is loose. Instead of tying the cords to the hooks, small watch-chain-hooks are provided for the purpose. The material of the cords is selected so that they will not twist by themselves.

An 8 oz. stoppered bottle which fits loosely in the copper case is thoroughly cleansed and placed in the metal cylinder. The stopper holder is applied to the stopper and pressed to catch it. The nuts and the triangular piece are screwed on the free ends of the metal bars and so adjusted that on lifting the stopper holder the mouth of the bottle is freely opened for the water to fill. The stopper is released from the stopper holder and little pieces of paper introduced in the mouth of the bottle to prevent the stopper getting jammed. The apparatus is now sterilized and the cords are hooked on. The distance between the mouth of the bottle and knots on the suspending cords will determine the depth of water at which the stopper will open and can be adjusted as desired, changing the size of central cords accordingly.

The stopper holder is again pressed on the stopper to catch it and the apparatus is now ready for use and can be lowered into a well or tank by means of a suitable cord or rope attached to the suspending cords. The bottle sinks directly on account of the weight of the copper case. The stopper float on reaching the surface of water automatically buoys up the stopper holder with the stopper, thus opening the bottle. After a short while big bubbles suddenly rise to the surface as the water displaces the air in the bottle.

The bottle fills in a few seconds and the apparatus is drawn up when no more bubbles appear. Sometimes a few short jerks may be required to open the stopper if it fits too tightly. As the float is lifted up from the surface of the water it drops back on the knots of the suspending cords thus loosening the central cord, the stopper holder falls back and automatically stoppers the bottle. This ensures prevention of contamination from the upper layers of water.

The stopper is then released from the stopper holder, the bottom lid is opened and the bottle is removed. It is properly labelled and sent back to the laboratory in a suitable case.

The following advantages may be claimed for this apparatus:—

1. It is cheap and easy to make.
2. It works automatically and can be entrusted to even untrained sample collectors.
3. It ensures exclusion of surface water.
4. It can be thoroughly cleansed and easily sterilized.
5. It can be adjusted to draw samples from stated depths within ordinary limits.
6. There are no parts likely to go out of order.

The apparatus can be suitably modified if samples are to be taken from bores of small diameters or great depths.

*Note.*—The apparatus can be obtained from the Upper India Scientific Works, Chamberlain Road, Lahore.

## PROTEIN REACTIONS OF BACTERIA.

(A plea for their routine use and intensive study.\*)

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Assistant Director, Haffkine Institute, Bombay.

### INTRODUCTION.

JUST as a chemist does not attempt to determine the constituents of a substance before he is certain of its purity, so will a bacteriologist not commence to work on the biological action of a bacterium until he satisfies himself of the purity of a culture.

The purity of a substance is ensured by means of repeated crystallization, and the purity of a bacterium by repeated plating. Further, just as the chemical is subjected to a melting point test or spectroscopic and other examinations to establish its purity, so too are the uniform bacterial colonies further subjected to staining reactions, morphological examination and cultural tests.

Among these last, biochemical reactions form an important part. Now reference to the literature will show that while practically all the attention has been focused on the carbohydrate reactions, very little heed has been given to protein reactions. The reasons are not far to seek.

A great variety of pure carbohydrates have been isolated or prepared by chemists and they were so much ready relatively cheap material to be used by Castellani in the identification of intestinal bacilli (*vide* his table) (1).

In the case of proteins chemists have only succeeded so far in isolating or preparing a few amino-acids and producing fractions which are

\* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad, January 1930.

very complex mixtures of little known constituents. Amino-acids by themselves do not suffice as bacterial nutrients and further they are far more costly for routine use than the majority of carbohydrates. Hence the necessity of falling back upon fractions formed by the partial hydrolysis of proteins which will act as bacterial nutrients and whose price will not be prohibitive.

The protein material available for protein reactions are the different brands of peptone. The protein reactions referred to in this note are (1) Indole, (2) Hydrogen sulphide, (3) Nitrite, and (4) Cholera-red. In Table I are shown the sources of these products, and the reagents commonly used in their detection.

Regarding this test the Committee of Bacteriological Technique of the Society of American Bacteriologists in their 1926 edition of the *Manual of Methods for Pure Culture Study of Bacteria* write:—"The indole test has long been considered one of the least satisfactory of those employed in pure culture study. Recent years, however, have seen considerable work on the test, as for example that of Ziprel (1912), Frieber (1921), Fellers and Clough (1925), Goré (1921), Holman and Gonzales (1923), Kulp (1925), and Koser and Galt (1926); and as a result it can now be used more intelligently than in the past."

"It is recommended that the Goré and the Gnezda tests be used in a routine way. (Results

TABLE I.  
*Protein in reactions.*

Product.	Source.		Reagent.
	Organic.	Inorganic.	
Indole .. .. .	Tryptophane .. .. .		Ehrlich's aldehyde.
Hydrogen sulphide .. .. .	Cystin, cystein .. .. .	Sodium sulphide .. .. .	Lead acetate.
Nitrite .. .. .	Protein matter .. .. .	Sodium hyposulphite .. .. .	
Cholera-red .. .. .		Sodium nitrate .. .. .	Hosvay's solutions.
		Indole + Nitrite	Strong HCl.

From this table it will be seen that indole has only one source, viz., the amino-acid tryptophane, while hydrogen sulphide and nitrite have more than one source in both the classes of substances.

All these reactions, though known for a long time, have not yet received the recognition they deserve.

Besides their utility in the identification of bacterial species, they deserve special consideration because they are likely to throw light on the correlation between *in vitro* and *in vivo* reactions.

Such a possibility, long conjectured by the author, has now received such experimental support as to justify its being brought to the notice of the Indian Science Congress.

In passing it may be remarked that among the indoligenous bacteria there are far fewer pathogens than among the hydrogen sulphide- and nitrite-producing bacteria; the former group contains many putrefactive and the typhoid-paratyphoid-enteritides bacteria, while the latter group contains, besides the cholera vibrio, *B. pestis*, some members of the Pasteurella group of bacilli, and the diphtheria bacillus.

### 1. Indole.

Indole which was first applied as a differential test between *B. coli* and *B. typhosus* by Kitasato as far back as 1889, has only recently been recognised as a dependable test.

with these two tests agree closely as shown by Kulp) . . . . . The Ehrlich test unmodified is less specific for indole than the Goré modification or the Gnezda test." (2)

With respect to the three methods of testing for indole referred to by the Committee, Koser and Galt write:—"Of the several indol tests employed in our work we are inclined to favour the Goré method as the most satisfactory which may be used where large numbers of cultures are to be examined. It possesses most of the advantages of the oxalic acid method and in addition it is more delicate and the colour of the positive test is deeper and more striking than the pink tint of the oxalic acid paper.\* In our hands the Goré test has never yielded the confusing colours or false positive tests that are secured when the reagents are added directly to the culture,† and at the same time appears to be as delicate under these conditions. Also, it has given pronounced and striking positive tests when applied to agar slant cultures of indol-producing organisms, even when a peptone of low tryptophane content was used in the medium." (3)

The Cotton Wool Plug Test was devised by the author in 1920 and was based on the facts that indole was volatile and that Ehrlich's aldehyde was the most delicate reagent for it. In 1921, this test was critically studied along

\* That is the Gnezda test.

† Ehrlich's test.

with eight other tests, by Malone and Goré, and as a result of this study they concluded that "The method which combines delicacy and specificity, and best fulfils the conditions laid down for a routine test is that described under the heading 'Goré's Cotton Wool Plug Test.' Under the conditions of these experiments and in actual practice it has been found to be a simple, delicate and reliable method."

Regarding the inhibitory influence of nitrite on the Ehrlich test, they wrote, "As Marshall pointed out, the Ehrlich reaction is inhibited by the presence of nitrites, and this fact should be borne in mind when testing cultures of cholera and cholera-like vibrios in ordinary broth. We have found that there is a definite (quantitative) relation between indole content of a culture and the amount of nitrite sufficient to cause the total inhibition of the rose-indole reaction, i.e., with small amounts of indole correspondingly small amounts of nitrite will inhibit the colour reaction."

"It is unsafe to apply the Ehrlich reaction to nitrate broth cultures, as a large number of bacteria are capable of reducing nitrates to nitrites. It appears, however, from the following experiment that this object is not valid if the Cotton Wool Plug Test be applied." (4)

Test applied.	Twenty-four hours culture of 1 per cent. Fairchild's peptone nutrient broth containing 0.1 per cent. potassium nitrate.	
	<i>B. coli.</i>	<i>V. cholerae.</i>
Ordinary test (Ehrlich's).	Yellow colour.	Yellow colour.
Chloroform extraction.	Faint trace of pink.	Faint trace of pink.
Steensma test ..	No trace of pink.	No trace of pink.
Goré's test ..	Rose colour.	Rose colour.

Thus when the Ehrlich test is performed in the culture itself, the nitrites destroy the reagent and in consequence no pink colour develops. In the Goré test, the reagent is outside the reach of the destructive influence of the nitrite and is consequently available for the volatilised indol to act and colour the cotton wool pink.

In spite of these advantages of the Cotton Wool Plug Test being established in 1921, and confirmed by other workers in 1925 and 1926, in the latest edition of Muir and Ritchie's *Manual of Bacteriology*, edited in 1927 by Browning and Mackie, we find the Ehrlich test being performed in the same way as it was in 1906. They write:—"The Ehrlich test.... is of special value in dealing with organisms of the coli-typhoid group.... The reaction is also obtainable with the cholera vibrio, but further

investigation is here necessary, as Marshall states that under certain circumstances the nitrites formed by this bacterium may have an inhibitory effect on the formation of the rose colour." (5)

Having devised a simple, delicate and specific test for detecting indole, and believing that a protein reaction would be as efficient a combination with carbohydrate reactions, as it is in a dietary, the author devised a three-culture scheme of grouping intestinal bacilli, and presented it at the Indian Science Congress held at Bangalore in 1924. In this scheme the primary grouping is based on the two most commonly used carbohydrates, viz., glucose and lactose, while the secondary groups are effected by combining with these carbohydrate reactions, a protein reaction, viz., indole and a carbohydrate reaction, viz., carbinol—the so-called Voges-Proskauer reaction. This scheme is shown in Chart 1.

The subgrouping and cultural identification of individual species was based on Castellani's Table of the Cultural Reactions of Intestinal Bacilli. (6)

Since the receipt of Bergy's *Manual of Determinative Bacteriology* and the study made in association with Malone of a large number of stools derived from healthy persons, as well as from cases of diarrhoea, dysentery and sprue, along the lines of the classification outlined above, the subgroupings were made more comprehensive than the previous ones.

The association of the protein reaction indol with the two most commonly used carbohydrate reactions so greatly facilitated the cultural identification of the intestinal bacilli, and stood in such great contrast with Castellani's tables in the cultural identification of intestinal bacilli, that one is tempted to apply to his scheme the famous French epicurian Brilliet Sararin's epigram "Tell me what you eat; I tell you what you are"; while to Castellani's tables may be applied another epigram suggested, as being more modern, by the late Dr. Priestly, viz., "Tell me what you are; I tell you what to eat."

It is obvious that bacteria when they are secured by us do not tell us anything except their source and morphology. Beyond this they are unable to give any further information as to their identity until we subject them to either of the above ways of recognising them.

## 2. Hydrogen Sulphide.

In 1924, a paper embodying the results of the bacteriological examination of the stools referred to above was read by Goré and Malone at the Critics' Club, Haffkine Institute. In the remarks made by Col. Mackie, he suggested the study of hydrogen sulphide production by the intestinal bacteria.

Accordingly, this reaction formed the second protein reaction which was taken up by the author for study.

CHART 1.

*The three-culture grouping of intestinal bacilli.*

Glucose.	Lactose.	Primary group formulae.	Alcaligenes.	Indole.	Carbinol.	Secondary group formulae.	Type bacteria.
0	0	0		0 I 0 I	0 0 C C	0 I C IC	<i>B. alkaligenes.</i> <i>Vibrio metchnikovi.</i>
	0	g	Typhoid - dysentery or Eberthiella.	0 I 0 I	0 0 C C	g gI gC gIC	<i>B. typhosus</i> ; <i>B. dysenteriae</i> (Shiga). <i>B. dysenteriae</i> (Flexner).
g	I	gl		0 I 0 I	0 0 C C	gl gII gIC gIIC	<i>B. metadysentericus.</i>
	0	G		0 I 0 I	0 0 C C	G GI GC GIC	Paratyphoid-gartner-aertrycke. <i>B. morgan</i> ; <i>B. columbiensis.</i>
G	I	GI	Salmonella	0 I 0 I	0 0 C C	GI GII GIC GIIC	<i>B. archibaldi.</i> <i>B. guimai.</i>
	L	GL	Colon - aerogenes or Escherichia-aerobacter.	0 I 0 I	0 0 C C	GL GLI GLC GLIC	<i>B. grunthali.</i> <i>B. coli.</i> <i>B. lactis aerogenes.</i> <i>B. cloacae.</i>

0 = No acid or gas production in carbohydrate media; 0 = No indole or carbinol production.  
 g = Acid production in glucose I = Acid production in lactose.  
 G = Acid and gas production in glucose I. = Acid and gas production in glucose.  
 I = Indole production C = Carbinol production.

During the war period, when the author was in charge of the work in connection with the identification and confirmation of the bacilli isolated at the War Hospital in Bombay and other places, he had used both these reactions—viz., indole and hydrogen sulphide—routinely according to the methods prescribed in textbooks on bacteriology, but found the results to be not very consistent. In consequence, as little importance came to be attached to the reactions then, as we find to be the case in the present day textbooks on bacteriology.

In the course of a comparative study of the textbook methods of determining the hydrogen sulphide character of intestinal bacilli—which were again found to be as unsatisfactory as during the war period, it occurred to the author to apply the Cotton Wool Plug technique to detect hydrogen sulphide in peptone cultures, using lead acetate solution in place of Bohme's. (8)

This device not only succeeded as well as it had done in the case of indole, but allowed the detection of these two products in the same bacterial culture, leaving the culture available for further use; and as mentioned further on, this same peptone culture has been made use of in determining the presence of nitrite and the cholera red reaction. (7)

As far as is known at present, indole has only one source, from which it could be produced, viz., tryptophane, either in the free state and in a polypeptide or peptide form. Such is not the case with hydrogen sulphide. It may be produced from free cystin or cystein, or the presence of either amino-acid in a peptide or polypeptide, or from mineral salts, e.g., sodium hyposulphite or sodium sulphide.

An important point has not yet been sufficiently appreciated, that the availability of the sulphur-containing amino-acid in a peptone depends probably on its position in the peptone.

Thus a bacillus may produce hydrogen sulphide from one brand of peptone but not from another, though the sulphur-containing amino-acid is present in both the peptones.

The utilisation of the different sources of hydrogen sulphide for differential and identification purposes still remains to be adequately dealt with.

From a study made with four brands of peptone with the broth made from the acid meat digest and used in the preparation of Haffkine's prophylactic, with two commercial meat extracts, and with infusion of meat, it appears that, judged by their capacity to produce indole and hydrogen sulphide when acted upon by different kinds of bacteria, some of these products were found to give more constant results than others. This subject is being further studied and will form the subject of another paper.

### 3. Nitrite.

The third protein reaction to be referred to in this paper and which forms the major portion thereof is nitrite. Like hydrogen sulphide, nitrite may be produced either from an inorganic or an organic substance.

It may be pointed out here that while the general impression among bacteriologists with reference to hydrogen sulphide is that it is derived from an organic source, the reverse is the case with nitrite.

A reference to many of the textbooks on bacteriology will show that the presence of nitrites in bacterial culture is assumed to be due to reduction of a nitrate in the medium either added on purpose or present as an impurity.

It is only a few authors like Kendall and Muir and Ritchie who clearly state that nitrite in a peptone water culture of the cholera vibrio is derived from the peptone; and it is the presence of a nitrite so derived that contributes to the cholera-red reaction and differentiates a cholera culture from a *B. coli* culture. However, if a nitrate was present in the medium in which *B. coli* was grown, the culture would respond positively to the cholera-red reaction, which as is well known depends on the simultaneous presence of indole and nitrite in the culture.

With a view to make this distinction quite clear, the above facts are arranged in Table II.

In the previous table it has been shown that nitrite may be derived either from protein or from a nitrate and that the cholera-red reaction depends on the simultaneous presence of indole and nitrite in the culture.

From the above table it will be seen that a cholera culture will give a positive cholera-red reaction irrespective of the presence of a nitrate in the peptone water. On the other hand, a *B. coli* culture will show a positive cholera-red reaction only when a nitrate is present in the peptone water but not when it is absent.

That nitrite has an organic source has been mentioned by the authors referred to above, only in connection with the cholera vibrio. The generality of bacteriologists have been wont to take nitrites as derived from a nitrate, notwithstanding the fact that when nitrite is derived from an organic source, it is an oxidation product, while when derived from an inorganic source, e.g., a nitrate, it is a reduction product.

Thus it will be seen that of the three protein reactions referred to in this paper, nitrite as a protein product is the least known, and this fact was well brought out at the time of the discussion that followed the author's referring to nitrite production by *B. pestis*, at the Indian Science Congress held at Madras in 1929.(10)

It has been mentioned above that nitrite occurring in peptone culture has been referred to by a few bacteriologists as one of the substances necessary for the cholera-red reaction. It has not been independently investigated; and the large amount of work done on nitrite as a cultural test in the identification of bacteria refers to the product derived from the reduction of a nitrate. It is in this latter connection that Muir and Ritchie give Ilosvay's reagent for its detection.(5) In short, bacteriologists do not mention any bacillus other than the cholera vibrio as capable of producing nitrite as an oxidation product derived from protein matter.

The late lamented Dr. MacKenzie Wallis, Chemical Pathologist, St. Bartholomew's Hospital, was the first to isolate an intestinal bacillus other than the cholera-vibrio capable of producing nitrite from peptone. This organism was isolated from the fæces of cases of sulph-hæmoglobinæmia(9) and was like *B. alcaligenes* in its carbohydrate reactions. For the detection of nitrite, he used the same reagent, viz., Ilosvay's which is recommended for detecting

TABLE II.  
Cholera-red reaction.

Culture medium.	V. CHOLERÆ.		B. COLI.		CHOLERA-RED.	
	Indole.	Nitrite.	Indole.	Nitrite.	<i>V. cholera</i> .	<i>B. coli</i> .
Peptone water .. ..	+	+	+	0	+	0
Peptone water + pot. nitrate ..	+	+	+	+	+	+



nitrites when they happen to be present in a culture as a reduction product. In passing it may be mentioned here that during the course of the study of the faecal flora of the third series of sprue stools, a similar bacillus was isolated by the author, but later this particular case was declared not to be sprue.(11)

The opportunity for studying this third protein reaction, viz., nitrite, occurred when the determination of the purity of plague cultures used in the preparation of Haffkine's prophylactic formed part of the author's routine duties at the Haffkine Institute since 1924.

In the course of a detailed study of cultural reactions it was found that the peptone culture of *B. pestis* responded positively to the Ilosvay test,(7) and being a protein reaction, it was studied with reference to a large variety of bacteria stocked at the Haffkine Institute, with a view to determine its possibilities as a differential character.

Among the intestinal bacilli, no member other than the cholera and cholera-like vibrios were known to be capable of producing nitrite from peptone previous to the nitro-bacillus of MacKenzie Wallis, neither in routine cultural work was nitrite determined except as a reduction product.

In the group of bacteria belonging to hæmorrhagic septicæmia, *B. avisepcticus* was found to be capable of producing nitrites, and since it produced indole as well, its peptone cultures necessarily gave a positive cholera-red reaction, a fact that does not appear to have been recorded in the literature; the author was the first one to determine in 1925 the nitrite-producing properties of this organism.

*B. pseudotuberculosis*, a bacterium liable to be confused with *B. pestis* on account of similar carbohydrate reactions, was found to give a negative response to the Ilosvay test.

*B. bovisepcticus*, a member of the hæmorrhagic septicæmia group of bacilli, was also found incapable of producing nitrite; on the other hand it produced indole and was thus easily differentiable from *B. pestis*.

It will thus be seen that the nitrite test as applied to peptone culture has a great differential value for *B. pestis*, which is incapable of producing hydrogen sulphide or indole. The nitrite reaction in the peptone culture of *B. pestis* has been found to persist for over three months—the longest period observed. In Tables III and IV are given the protein and carbohydrate reactions of the ten strains of fowl cholera in stock at the Haffkine Institute and of the fifteen cultures of the Pasteurella group given by Dr. B. P. B. Naidu, M.D., for determining their cultural characters according to the procedure adopted by the author for *B. pestis*.

In 1925 the author noticed that nitrite had a differential value for *B. pestis* and it will be seen that in this fairly representative variety

of members of the Pasteurella group, there is only one culture, viz., No. 6 which produces only nitrite like *B. pestis*, but unlike the latter grows properly on agar and does not ferment even glucose. Strains Nos. 1 and 16 resemble *B. pestis* in their carbohydrate reactions: of these No. 1 grows properly on agar, while No. 16 behaves like *B. pestis*. Thus of all these organisms Dr. Krishnamurthy's bacillus is the only one which resembles *B. pestis* in its carbohydrate and agar surface characters, but fails in the essential character of nitrite production which it fails to produce in twenty-four hours' incubation as a rule.

It will thus be seen how the cultural tests devised by the author and used alongside with those drawn up by Col. Mackie, assist in an easy differentiation of *B. pestis* from all the members of the Pasteurella group.

Tanaka studied 26 cultures of hæmorrhagic septicæmia organisms from different animals and found a striking similarity in most of the cultural characteristics, in that among other characters all produce indol, ferment sucrose, and reduce nitrates to nitrites. There is no mention of nitrite produced from protein, nor of the cholera-red reaction.

Among the bipolar Gram-negative bacteria that are capable of producing acid in glucose and mannite and no change in lactose and sucrose, are *B. pseudo-tuberculosis* and Dr. Krishnamurti's bovine lymphangitis bacillus. With respect to *B. pseudo-tuberculosis* it has been pointed out above that it is incapable of producing nitrites.

Dr. Krishnamurti's organism is a poor grower in Bactopeptone water and sometimes gives a very faint nitrite reaction, not on 24 hours' incubation at 37°C. as does *B. pestis* invariably, but after 3 or 4 days' incubation. This organism, though resembling *B. pestis* in certain respects, is easy of differentiation therefrom by the protein reaction, and other characters.

I take it that very few bacteriologists would spend time on the serological identity of bacteria that are culturally not identical.

So far an attempt has been made to plead the importance of protein reactions in the identification of species of bacteria. In view of the fact all the four protein reactions can be determined in the same peptone culture, the scheme shown in Chart 1 has been further modified and will be published at length in another place.\*

A discovery likely to be of great moment and promise is the differential value of the nitrite reaction in the case of the variants of *B. avisepcticus*. For the material which led to this discovery, I am indebted to Major L. A. P. Anderson, I.M.S., Offg. Director, Haffkine

\*In order to give an idea how the scheme helps in an easier identification of aerobic bacilli, an abridged form of the revised scheme is shown in Chart 2, Appendix.

TABLE III.

*B. avisepticus: ten strains from the collection at the Haffkine Institute.*

Bacillus avisepticus Strain number.	PEPTONE CULTURE.				Glucose.	Mannite.	Lactose.	Sucrose.	Total number of colonies.	NUMBER OF COLONIES GIVING POSITIVE.	
	S	N	I	CR						N	CR
65	0	+	+	..	A	A	0	A	3	0	0
66	0	+	+	+	A	As	0	A	2	1	0
67	0	+	+	..	A	A	0	A	6	0	0
68	0	+	+	+	A	0	0	A	6	6	6
69	0	0	+	..	A	0	0	A	6	4	4
219	0	0	+	..	A	0	0	A	6	5	4
220	0	+	+	+	A	0	0	A	3	3	3
251	0	tr	+	+	A	?	0	A	6	6	6
281	0	0	+	..	A	A	0	A	6	5	4
282	0	0	+	..	A	?	0	A	3	3	3

TABLE IV.

*Members of Pasteurella Group: their biochemical reactions.*

No.	Organism.	PEPTONE CULTURE.				Glucose.	Lactulose.	Mannite.	Lactose.	Sucrose.	Dulcitol.	Growth on agar in 24 hours.
		S	N	I	CR							
1	<i>B. tuberculosis</i> : mouse.	0	0	0	..	A	A	A	0	0	0	+
2	<i>P. mouse</i> ..	0	0	+	0	A	A	A	0	A	0	0
3	<i>P. rat</i> ..	0	+	+	+	A	A	A	0	A	0	+
4	<i>P. pig</i> ..	0	+	+	+	A	A	A	0	A	0	0
5	<i>P. fowl</i> ..	0	0	+	0	..	..	..	..	..	..	0
6	<i>P. pig</i> ..	0	+	0	0	0	0	0	0	0	0	+
7	<i>P. epago</i> ..	0	0	+	0	A	A	A	0	A	0	0
8	<i>P. secep</i> ..	0	0	+	0	A	A	A	0	A	0	0
9	<i>P. tiger</i> ..	0	0	+	0	A	A	A	0	A	0	0
10	<i>P. dog</i> ..	0	0	0	..	0	0	0	0	0	0	0
11	<i>P. pet kangaroo</i> ..	0	0	+	0	A	A	A	A	A	0	0
12	<i>P. cat</i> ..	0	0	+	0	A	A	A	0	A	0	0
15	<i>B. tuberculosis</i> : rodent.	0	0	0	..	0	0	0	0	0	0	0

Institute,(12) and but for the presence of an accidental contaminant in one of the two variants, and performing the nitrite and cholera-red tests on different days instead of on the same day, this point of difference would have remained unnoticed.

The single culture test for the protein reactions is carried out as follows:—

(1) One per cent. peptone (Bactopeptone) containing 0.5 per cent. salt is tubed in about 4 c.c. quantities in small test tubes and plugged with white absorbent cotton wool.

#### *The Detection of Hydrogen Sulphide.*

(2) The culture under investigation is inoculated into the peptone water and the under surface of the cotton wool plug is moistened with a drop or two of 5 per cent. lead acetate solution stocked in small drop bottles. The tube is then kept in the incubator at 37°C.

(3) After overnight incubation, the under surface of the cotton wool plug will be found browned or

blackened if the culture was capable of producing hydrogen sulphide; if not, there will not be any change in the plug.

#### *Detection of Nitrite.*

(4) One 5 mm. loopful of the culture is now removed onto a white opal glass plate and a 2 mm. loopful of a freshly prepared Hoesvay's reagent\* is mixed in the culture on the plate. If nitrites are produced by the bacterium, the mixed drop will become pink within a minute. If no pink colour develops in two minutes, the reaction is taken as negative.

#### *Detection of Indole.*

(5) The rough upper end of the cotton wool plug is smoothed by folding up the rough projections, and

\**Hoesvay's Reagent.*—(1) Sulphanilic acid 1 g., Glacial acetic acid 14.7 g., Water 285 c.c.  
(2) Naphthalmine 0.2 g., Glacial acetic acid 14.7 g., Water 325 c.c. These two solutions are stocked in drop bottles. For use an equal number or drops of the two solutions are mixed together in a Wassermann test tube.

then one or two drops of potassium persulphate solution\* and one or two of Ehrlich's aldehyde solution† are dropped in succession on the smoothed end of the cotton wool plug, which is then inverted and replaced in the peptone culture tube, so that the newly treated surface faces the culture. The culture is then again put in the incubator for a day. If the bacterium is an indole producer, there will be a pink colour visible on the cotton wool facing the culture. If no pink is to be seen, the bacterium is a non-indol-producer.

If further observations on nitrate production are to be made, the culture is further incubated and tested for nitrite from day to day. After this, the culture is used for determining

*The Cholera-red Reaction.*

(6) To the peptone culture about one or two drops of strong hydrochloric acid are added. In the case of a positive reaction, a pink colour develops.

on ordinary agar and marked *B. avisepticus* "R" variant.

Since *B. avisepticus* belonged to the Pasteurella group which includes or is allied to *B. pestis*, all the necessary cultural tests detailed by the author in his paper on the "Isolation, Enumeration and Identification of *B. pestis* by Cultivation Methods" (10) were applied to the two variants of *B. avisepticus*.

The first series consisted of liquid cultural tests shown in Table V, while the second series consisted of surface cultivations on different kinds of media the results of which are shown in Table VI.

TABLE V.  
*B. avisepticus: its two variants: cultural reactions of.*

Bacillus avisepticus.	Period of incubation.	PEPTONE CULTURE.			Glucose.	Lævulose.	Mannite.	Lactose.	Sucrose.	Dulcite.
		H <sub>2</sub> S.	Nitrite.	Indole.						
"S" Variant ..	1 day	0	+	+	A	A	A	0	A	0
	2 days	..	+	+	A	A	0	0	As	0
	3 days	..	..	..	A	A	0	0	A	0
"R" Variant ..	1 day	0	0	+	A	A	A	As	A	0
	2 days	..	0	+	A	A	A	A	A	0
	3 days	..	..	..	A	A	A	A	A	0

TABLE VI.  
*B. avisepticus: its two variants: their surface cultures.*

Bacillus avisepticus.	Period of incubation.	5 mm. loopful of broth culture on acid agar.	5 MM. LOOPFUL OF DILUTION ON		1 MM. LOOPFUL OF DILUTION ON	
			Standard agar.	Acid agar.	Blood agar.	Blood bile agar.
"S" Variant	1 day	Smooth glossy surface growth.	Sterile	Closely set colonies.	Sterile	Numerous discrete colonies.
"	2 days	"	"	"	A few very tiny colonies.	"
"R" Variant	1 day	Confluent colonies.	Closely set colonies, numerous, discrete.	..	..	....
"	2 days	Plague-like surface growth.	Small yellowish colonies.	About 50 large opaque colonies.	Two sized colonies; a few like those on standard agar.	About 80 colonies, all uniform in appearance.

The two subcultures of *B. avisepticus* referred to above were of the two variants of this bacillus. One was on blood agar and labelled *B. avisepticus* "S" variant, while the other was

This table shows the results of the sowings of the two variants in the series of liquid media routinely used in the cultural identification of *B. pestis*.

Had these two variants been put up for the determination only of nitrite as required by Major Anderson, it would have been thought that the "S" variant produced nitrite, while the "R" variant did not. However, the carbohydrate reactions threw suspicion on the purity

*Bohme's Solutions.*—\*(1) Potassium persulphate 1 g.; Distilled water 100 c.c. †(2) Para-dimethyl-amido-benzaldehyde 1 g., Absolute alcohol 95 c.c., Hydrochloric acid 20 c.c. Dilute the resulting solution with an equal quantity of rectified spirit. These two solutions are stocked in drop bottles.

of the "R" variant culture, since it fermented lactose.

These two subcultures were first planted in broth and subsequently used to inoculate the following media, viz., peptone water, and a set of carbohydrates. A 5 mm. loopful of the broth cultures was also inoculated on acid agar. One 5 mm. loopful of the cultures was diluted in about 10 c.c. of saline and a 5 mm. loopful thereof inoculated on standard agar and on acid agar; a 1 mm. loopful of this dilution was inoculated on blood agar and bile blood agar.

Considering the results of the protein reactions as obtained from the peptone water cultures, it appeared as if there was a cultural difference between the two variants in the facts that while both produced indole and none hydrogen sulphide, the "S" variant differed from the "R" variant in producing nitrites.

However, on reference to the carbohydrate reactions a radical difference was noticed between the two cultures, viz., "S" variant did not ferment lactose, while the "R" variant fermented lactose.

This circumstance brought to the author's mind Weaver's note: "that every one who begins work with a culture which comes to him from any source will first assure himself of its purity and identity, and" of his (i.e., Weaver's) being "in full accord with the statement by Dr. Hall as to the first duties of any author who refers to a living organism by its generic and specific name to make sure by all means at his command of the identity of the form in question."

From Table VI it will be seen that while the 5 mm. loopful of "S" variant dilution planted on standard agar, showed no growth, that from the "R" variant dilution showed small yellowish colonies on the standard agar. These colonies being slightly chromogenic were suspected to be contaminations, and on being examined for their liquid cultural reactions it was found that they responded to none of the protein reactions, but fermented lactose (*vide* Table VII).

The above table represents the results of one of the five yellowish contaminant colonies. They were taken from among those on the

standard agar slope; all the five colonies showed results like the above. (1) All gave negative protein reactions and all fermented the first five carbohydrates with the production of acid. It was thus established that the lactose fermentation seen in the "R" variant in Table V was due to the presence of this contaminant.

It was thus established that the acidity produced in lactose by the "R" variant was due to the presence of a pale yellow contaminant.

The acid agar and bile blood agar slopes showed numerous discrete colonies of both the variants. Six colonies of "S" variant each from the acid agar and the bile blood agar, and three colonies of "R" variant each from the two kinds of slopes as above, were inoculated in peptone water to ascertain their protein reactions and incubated at 37°C. The next day, i.e., on one day's incubation, all the peptone cultures were found to be negative to the hydrogen sulphide test but positive to the nitrite test. After two days' incubation the indole reactions were read and found to be positive for all the eighteen colonies. The cholera-red test was then applied to all the cultures and to one's surprise it was found that while all the twelve peptone cultures of the "S" variant colonies responded positively, all the six "R" variant cultures gave a negative cholera-red reaction (*see* Table VIII, Section A).

It is well known that the cholera-red reaction when tested for on a peptone culture depends on the simultaneous presence of indol and nitrites, both these products being obtained from the peptone as a result of the bacterial action.

It was therefore surmised that the failure of the "R" variant peptone cultures to respond positively to the cholera-red reaction might have been due to some discrepancy with respect to nitrites. Nitrite was tested for after 24 hours' incubation and not tested for again after 48 hours' incubation when the indole tests were read and the cholera-test carried out. A circumstance to explain this phenomena is the probable disappearance of nitrite on 48 hours' incubation of the "R" variant culture.

In order to substantiate the above surmise, six fresh colonies of each of the two variants

TABLE VII.  
Contaminant from "R" variant: its cultural reactions.

Period of incubation.	PEPTONE CULTURE.			Glucose.	Lævulose.	Mannite.	Lactose.	Sucrose.	Dulcific.
	H <sub>2</sub> S.	Nitrite.	Indole.						
1 day	0	0	0	As	As	0	As	A	0
2 days	..	..	..	A	A	A	A	A	0

TABLE VIII.

B. avisepticus: colonies or variants: their protein reactions.

	INCUBATION PERIOD.								
	1 DAY.			2 DAYS.			3 DAYS.		
	N	I	CR	N	I	CR	N	I	CR
"S" Variant, 12 colonies	+	..	..	..	+	+	..	..	..
"R" Variant, 6 colonies	+	..	..	..	+	0	..	..	..
"S" Variant, Colony No. 1	tr	+	0	..	..	..	..	..	..
" " " " 2	+	+	..	+	+	+	..	..	..
" " " " 3	+	+	..	..	..	..	+	+	+
" " " " 4	+	+	..	..	..	..	+	+	+
" " " " 5	+	+	..	..	..	..	+	+	+
" " " " 6	+	+	..	..	..	..	+	+	+
"R" Variant, Colony No. 1	+	+	..	..	+	0	..	..	..
" " " " 2	+	+	..	0	+	0	..	..	..
" " " " 3	+	+	..	..	+	..	0	+	0
" " " " 4	+	+	..	..	+	..	+	+	+
" " " " 5	+	+	..	..	+	..	0	+	0
" " " " 6	+	+	..	..	+	..	0	+	0

were planted in peptone water and the resulting cultures were tested after one, two, and three days' incubation for indole, nitrites and the cholera-red reaction. The results obtained are given in Table VIII (Sections B and C).

After one day's incubation all the twelve cultures were tested for nitrite and indole and one of each kind tested for the cholera-red as well. After two days' incubation one culture of each variant was tested for the three reactions; and lastly the remaining four cultures of each kind were similarly tested after three days' incubation.

From this table it will be seen that, except for one culture out of the six, of the "S" variant all gave a positive indole, nitrite and the cholera-red reaction, even when the latter reaction was determined on three days' incubation in respect of the four cultures.

On the other hand out of the five colonies of the "R" variant examined on two and three days' incubation only one gave a positive cholera-red reaction, though all showed nitrite and indole on one day's incubation.

These results confirmed the surmise that while the "S" variant was capable of showing a positive nitrite reaction even when tested for on the fourth day of incubation, the "R" variant cultures contained nitrites 24 hours after incubation but not after 48 hours. Accordingly bacillus "S" variant would give a positive reaction after a fairly long period

the "R" variant would show it only after a long incubation and rarely after 48 hours.

*Bohme's Solution.* 1 g.; Distilled water 100 c.c. amido-benzaldehyde 1 g., Absolute alc. Hydrochloric acid 20 c.c. Dilute the resulting solution with an equal quantity of rectified spirit. These solutions are stocked in drop bottles.

it is interesting to note that among the four "R" variant colonies that were tested for the cholera-red reaction on the fourth day of incubation, there was one colony which resembled the "S" variant colony in its protein reaction. The presence of such a colony among the "R" variant colonies as examined by means of the protein reactions raises the question whether the colony referred to may not be of an intermediate type.

In order further to confirm the above findings, viz., that while the "S" variant shows a positive nitrite reaction for a fairly long period, and the "R" variant shows it only for a much shorter period of incubation, a large number of colonies from the "S" variant and the "R" variant slopes were put up in peptone water and the resulting cultures tested for the protein reactions after varying periods of incubation. The results as obtained are shown in Table IX.

From this table, Section A, it will be seen

- (1) That all the 68 colonies of the "S" variant continued to respond positively to the nitrite test beyond three days' incubation.
- (2) That out of 72 colonies of the "R" variant five failed to respond to the nitrite even after one day's incubation.
- (3) That out of 67 colonies of the "R" variant 12 responded positively after two days' incubation, and
- (4) That out of 6 colonies 1 responded positively on three days' incubation.

In Section (C) are given the details of variations in the periods of response to the nitrite test shown by a number of the "R" colonies.

TABLE IX.

B. *avisepticus*: colonies of variants: range of period of response to nitrite.

<i>B. avisepticus</i> .	NITRITE: AFTER INCUBATION PERIOD OF					
	1 day.		2 days.		3 or more days.	
	0	+	0	+	0	+
"S" Variant, 68 colonies ..	0	68	0	68	0	68
"R" Variant, 72 colonies ..	0	100%	0	100%	0	100%
	5	67	55	12	71	1
	7%	93%	76%	17%	99%	1%
"R" colonies, Nos. 1 to 6 ..	0	6	6	0	3	1
"R" colonies, Nos. 7 to 12 ..	0	6	1	0	3	1
12 colonies from No. 3 ..	0	12	8	4	..	..
12 " " " 4 ..	0	12	11	1	..	..
20 " " " 5 ..	4	16	20	0	..	..
14 colonies from No. 16 derived from No. 4.	0	14	7	7	..	..
2 colonies from No. 27 derived from No. 4.	1	1	2	0	..	..
	5	67	55	12		

*Discussion.*

It has been shown that in one culture all the four protein tests can be carried out, thus immensely facilitating the examination of a large number of cultures.

Of all these tests, indole is the most commonly used one, then comes the hydrogen sulphide test, and lastly the cholera-red reaction.

However, it is to be noted that the cholera-red test has been used in the case of the cholera and cholera-like vibrios only.

Whenever there is a mention of nitrite, it is generally understood to be derived from a nitrate present in the medium either on purpose or as an impurity. It is only a very few authors of textbooks on bacteriology who have made a clear mention of the fact that nitrite is derived from a protein substance as well, e.g., peptone of the culture medium; and this is mentioned only with reference to the cholera or cholera-like vibrio.

Dr. MacKenzie Wallis was the first to point out the presence of a bacillus other than the cholera vibrio, capable of producing nitrite from peptone, its presence in the culture being determined by means of the same reagent, viz., Ilosvay's, used in the detection of nitrites when produced from a nitrate.

The nitrite produced from a nitrate—an inorganic source—is a product of reduction, while the nitrite produced from a peptone—an organic source—is a product of oxidation.

Except MacKenzie Wallis' bacillus which resembles *B. alcaligenes* in its carbohydrate and staining reactions, there is no other bacillus which has been mentioned in the literature as a nitrite producer—of course barring the cholera and cholera-like vibrios.

Thus whenever Ilosvay's reagent is used for determining the presence of nitrite, it is a test for it as a reduction product and not as an oxidation one.

It was in the course of a detailed study of the cultural reactions of *B. pestis* that the writer found this bacterium to be a nitrite producer.

This finding, being a protein reaction, served as a valuable supplement in the system of control tests introduced by Col. Mackie for determining the purity of plague cultures used in the manufacture of Haffkine's prophylactic.

Since this important finding and absence of its mention in the literature except with reference to the two organisms mentioned above, the nitrite test was applied to the peptone cultures of a large variety of bacilli. As a result it was found that *B. diphtherie* and *B. avisepticus* were among nitrite producers, while *B. pseudo-tuberculosis*, a bipolar bacillus generally confounded with *B. pestis* owing to similarity in their carbohydrate reactions, was incapable of producing nitrite in its peptone culture. *B. bovissepticus*, another member of the Pasteurella group of bacilli, does not produce nitrite, but is capable of producing indol.

*B. pestis* is capable of producing nitrite, as is also *B. avisepticus*; however, the latter produces indol, while the former does not. Both these organisms are incapable of producing hydrogen sulphide.

These three protein reactions have now been introduced in the classification of bacteria which has been further modified as will be seen from the three culture method detailed anew in another place.

So far no biochemical reaction has been described by means of which variants of a species of a bacillus could be differentiated.



It is, therefore, interesting, to point out here that in the nitrite test a differentiating character has been found by means of which the two variants, viz., the "S" and "R" variants of *B. avisepticus* could be differentiated.

Major Anderson recently completed a study "On the Dissociation of *B. avisepticus*" and gave the author two subcultures—one of the "S" variant and the other of the "R" variant of this bacillus for the determination of their nitrite character.

Since *B. avisepticus* belongs to the same group of bacilli as *B. pestis*, the two subcultures were put up for the routine tests used by the author for the cultural identification of *B. pestis*. As the result of two accidental circumstances in the course of this investigation, a discovery has been made which may be of value in the purification of certain cultures intended for biological tests—serological and virulence.

The first circumstance was the detection of a contaminant in the "R" variant culture, and the second was the carrying out of the tests for nitrite and cholera-red on different days. The first led to a detailed study of several colonies resulting in the finding of mixed types, and the second to a differential value in the length of the period of response to the nitrite test.

The "S" variant colonies of *B. avisepticus* all responded positively to the nitrite test over a fairly long period of incubation, while the response of the "R" variant colonies lasted for a much shorter period in a majority; in the case of a few colonies there was no response to nitrite.

Thus in the nitrite test there has been discovered not only a protein biochemical character to distinguish the "S" from the "R" variant of *B. avisepticus*, but a possible criterion by means of which the course of dissociation of a soft culture may be followed up with greater precision than by means of the tests used at present; and thus a more uniform culture for biological tests may be obtained than otherwise.

It would thus appear that of the two protein characters of *B. avisepticus*, the nitrite character has been shown to be labile. It would be interesting to see whether the indol character could be similarly obliterated and what effect it would have on the *in vivo* tests.

The phenomena observed above, viz., the disappearance of the nitrite reaction in the peptone culture of a rough variant of *B. avisepticus*, has not so far been noticed by the author in the case of *B. pestis*; the number of individual colonies submitted to this test being not less than some hundreds.

If a test tube reaction could be found to correlate with virulence it may facilitate routine work connected with the manufacture of vaccines and sera on a large scale.

The nitrite producing bacteria contain as observed above, *B. pestis* and some other members of the hæmorrhagic septicæmia group of bacilli. It also contains *B. diphtheriæ*, thus altogether the nitrite forming character of these bacilli is worth an intensive and intelligent study.

If such a study is found fruitful, hydrogen sulphide and indole production of bacteria may be taken up for a similar investigation.

The hydrogen sulphide producing bacteria include *B. typhosus*, *B. paratyphosus* B and C, *B. enteritidis* and other food poisoning group bacilli. The classification of these bacilli demands a quantitative study of this character. So far it has only been partially studied and that too only qualitatively.

Further knowledge on a subject could only be gained by a quantitative study and the three long known protein reactions referred to in this paper await such a study.

The indole character, though associated mostly with commensals, includes the Flexner and other dysentery bacilli, such as the *meta-dysentericus*. Among these types there are strains which are not capable of producing indols. There is little information available regarding the difference in the virulence of indoligenous and anindoligenous strains, as manifested either in human cases or in experimental animals.

It is known that Shiga's dysentery bacillus which is a non-indol-producer is more virulent than Flexner's. So is *B. paratyphosus* A a fever severer in type than that caused by *B. columbiensis*. The cultural difference between these latter two organisms is their indolic character; the former is incapable of producing indole while the latter is not.

Many other instances could be cited in support of the case made out in this paper for an intensive and intelligent study of the protein characters of bacteria, and nowhere is there a greater opportunity for the co-operation of bacteriologists and chemists than in a subject like the one under review.

Dr. Gilbert Fowler writes: "Prof. Donan in his stimulating British Association address on the mystery of life advocated the study of the biochemistry of unicellular organisms as the shortest path to the solution of many fundamental problems."

Prof. J. F. Thorpe says "...too little is being done to approach the problems from the purely organic chemical side, and too few of the people engaged in biochemical research have an adequate knowledge of organic chemistry or the method of the organic chemist. The number of organic chemists who are co-operating with biologists in their attack on natural processes is too few."

The few and minor observations that the author has been able to record in this paper are the result of the opportunity he had in the

DIFFERENTIAL GROWTH WHEN CULTURE IS SPARSELY SOWN ON			CONFIRMATORY TESTS.									Number of species.	FÆCAL FLORA IN			
			GLUCOSE.		CULTURAL BIOLOGIC.								Health.	Diarrhœa.	Dysentery.	Sprue.
					Fermentation.	V. P. reaction.	Sucrose.	Dulcite.	Citrate.	Litmus milk.	Gelatin.					
Agar.	Blood agar.	Hæmo- lysis.											%	%	%	%
+	+	-	no change. = 0	0	0	0						3	0		+	+
-	+	±			0	0										
					0	0			0							
±	+	±			0	0										
+	+	-	g acid in glucose.	0	0	0	0	0	0	+		50	0	3	52	28
+	+	-			0	0	0	0	0	+						
+	+	-			0	0	0									
+	+	+			f	0										
+	+	-			0	0			+							
+	+	±			0	0										
+	+	+			f	0										
+	+	-			0	0				+						

...giving the results of biological tests more con-  
cordant than as at present.  
In fine, in the history of cultural reactions,  
it is for the first time that a protein reaction,  
viz., nitrite production, has been shown to cor-  
relate with virulence.

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due to *B. asiaticus*. *Jr. of Trop. Med. and Hyg.*,  
XV, 161.

#### A CASE OF FULL TERM ABDOMINAL PREGNANCY: LIVING MOTHER AND CHILD.

By A. H. DRIVER, M.B., Ch.B.,  
London Mission Hospital, Jammalamadugu, Madras  
Presidency.

On 21st January, 1930, there came into hospital  
from a distant village a woman whose condition



course of his routine duties in connection with the investigation first of water bacteria, then of faecal bacilli, and lastly of the plague bacillus. No observation has been put forward in this paper that was not the result of personal work.

If further work on the lines suggested in this paper is found to be in conformity with the present work, other protein reactions may be similarly made use of in studying the variants of respective species.

### Summary.

1. That the value of the four long known protein reactions—viz., hydrogen sulphide, indole, nitrite and cholera-red—is an easier and more definite mode of identification of bacteria than by means of carbohydrate reactions alone, has been shown in previous studies.

2. The routine testing of these products has been greatly facilitated by the introduction of a method by means of which the presence or absence of all these products can be ascertained in the same liquid culture.

3. The conjecture made by the author that a correlation between *in vitro* and *in vivo* reactions is more likely with protein than with carbohydrate reactions has found a proof in the nitrite test, which has been shown to distinguish the "S" variant of *B. avisepticus* from its "R" variant.

4. In the nitrite reaction, a characteristic of some of the important member of the Pasteurella group of bacilli and of *B. diphtheriae*, there is a promise not only of differentiating the variants of a species, but of anticipating their pathogenicity and serological behaviour.

5. Lastly, it may not be extravagant to hope that what has been found to be true in the case of one protein reaction, may also be found of value in the case of the other protein reactions.

### Conclusion.

It has been shown in this paper that by means of the single procedure devised by the author for the determination of the four protein characters, viz., hydrogen sulphide, indole, nitrite and cholera-red, not only can certain species of bacteria be more easily differentiated than by means of the carbohydrate reactions alone, but also the variants of a species *B. avisepticus*—can be distinguished and the degree of dissociation can probably be measured, rendering the results of biological tests more concordant than as at present.

In fine, in the history of cultural reactions, it is for the first time that a protein reaction, viz., nitrite production, has been shown to correlate with virulence.

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### NOTES ON CHART 2.

1. Discrete colonies are obtained from the material under examination by sowing its serial dilution on agar and superimposed blood agar slopes.

2. Type colonies are cultivated in peptone water and purity established by planting the peptone culture on agar and superimposed blood agar slopes.

3. Each type of colony is then sown in (i) glucose broth, (ii) litmus lactose peptone water and in (iii) bacto-peptone water. The positive reactions in these media give the formulae for the cultures.

4. Reference to the source of the bacillus, the differential growth on agar and blood agar, Gram stain and motility indicate the probable species of the bacillus.

5. Confirmatory tests finally define the species.

*Remark.*—Believing that it is not enough to arrive at a classification, which after all is merely an aid to description, in the last four columns of Chart 2 are shown the results obtained with respect to the aerobic faecal bacilli in health and disease.

## A Mirror of Hospital Practice.

### A CASE OF FULL TERM ABDOMINAL PREGNANCY: LIVING MOTHER AND CHILD.

By A. H. DRIVER, M.B., CH.B.,

London Mission Hospital, Jammalamadugu, Madras Presidency.

ON 21st January, 1930, there came into hospital from a distant village a woman whose condition

exemplified one of those curiosities of medicine whose occurrence enliven the routine of a mofussil hospital. She had been having "labour pains" for four or five days, of considerable intensity, her last confinement, the first, having taken place seven years ago. On examination a child's head could be clearly made out just below the umbilicus, and apparently just beneath the abdominal wall. Occasional movement and bulging in the right flank suggested a free limb. The os was soft and normal in position, but quite undilated. Fœtal heart sounds were clear. She gave a history of uninterrupted amenorrhœa for eight months prior to admission. Suspecting an extra-uterine gestation I urged an immediate abdominal section but as the "pains" subsided considerably this was refused until the third day after admission when recurrence of pain made patient and relatives submit to my persuasive efforts. On 23rd January afternoon, under chloroform-ether, with the assistance of Mr. J. R. Sampson, L.M.R., I made the usual Caesarean incision, and immediately under the peritoneum was a thickened fœtal sac which was incised and from which was extracted, head first, a living male child weighing 6½ lbs. The sac contained a little grumous fluid, and was attached firmly to loops of small gut which prolapsed freely into it. The placenta was bipartite and about double the normal size. Of its two sections the major portion, three times the size of the minor, was perched on the top of the fundus of the uterus completely concealing that organ from view. At its centre it was densely attached to the peritoneum covering the fundus. The minor section of placenta was unattached, filling up the right pelvis. The uterus itself was little more than normal in size. To release the main placenta I had to cut horizontally through the fundus, controlling the brisk bleeding by ligatures and mattress sutures. Ovary and tube on the right side appeared to be normal in size and position. Ovary and tube on the left side were adherent to the wall of the sac, but the tube showed no sign of sacculation or of previous rupture, and the ovary showed no abnormality. I noticed no sacculation at one cornu of the uterus that might have suggested an interstitial pregnancy. As much of the sac as could be safely removed was cut away along the bowel margin. The peritoneum was washed with saline and intravenous saline given. The mother made an uneventful recovery and was suckling her infant on the fourth day.

Cases of this nature are rarely seen outside large maternity hospitals. Their incidence is about 1 in 13,000 confinements, Lieut.-Col. Green-Armytage informs me. Probably cases in which both child and mother survive, and the former is free from deformity, are rarer still. The extraordinary position of the placenta seems to me to be one of the most striking features of this case.

#### A NOTE ON THE LOCAL TREATMENT OF LEPROUS ULCERS.

By MILTON C. LANG, M.D.,

*Hotel Chamossaire, Leysin Suisse, Switzerland.*

On taking up the work at the Chandkuri Leper Homes the writer found that the trophic ulcers—which, like the poor, were always with us—were being treated with an appalling array of remedies. In fact, every plausible application in the Pharmacopœia was used and these were amply supplemented by numerous home remedies, such as cow-dung, ashes, and poultices of various leaves, by the patients themselves.

Naturally our results from the treatment of this condition were poor and we at once elimi-

nated most of what appeared to be superfluous and useless drugs. Among them was iodoform which had been used in large quantities as a powder applied to the ulcers; thus, much was wasted. When the patients could no longer obtain *pila dewai* they became very dissatisfied and complained bitterly, saying that this, of all drugs, helped to relieve the pain which was caused by the ulcers in some cases.

In an institution of this type where other than gentle force is out of the question, it is very essential to keep the patients in a cheerful frame of mind, and at this time it seemed that the only thing that would do it was iodoform. Yet the expense had to be considered also. The point was, how to use iodoform effectively but not in a wasteful manner?

At first I attributed its effect largely to the psychological elements of colour and smell, but after having followed numbers of cases treated with it and others treated with different applications, I was convinced of its superiority both as to its powers to clear up infected cases and as to its analgesic effects.

I found that by using the drug in solution even better results could be obtained at a fraction of the cost. Two solutions are in use, one in acetone, and the other in eucalyptus oil. The former we use for the ordinary small and often painful ulcer, and the other for the large necrotic, sloughing types which if not carefully treated would rapidly lead to gangrene. The solutions are made as follows:—

(a) 16 grains of iodoform to the ounce of acetone.

(b) A 10 per cent. solution in eucalyptus oil.

At first we had difficulty in convincing our patients that we were using iodoform, but, when we swabbed an arm or two with the acetone solution and after a moment or two the acetone evaporated and left a yellow streak of iodoform plainly visible, there was no further trouble.

In using the solutions one is assured that the drug reaches all parts of the ulcer. It is perhaps needless to say that the ulcers must be otherwise properly cared for; dead or hardened flesh trimmed away, an indolent base transformed into a healthy granulating one by the judicious use of silver nitrate stick or the curette, sinuses opened up freely, and dead bone removed. The ordinary types are dressed every other day, but the sloughing varieties are dressed daily with cotton soaked in the eucalyptus oil solution which is tightly packed into the ulcer. This is done by a skilled dresser under the supervision of a medical attendant, who is able to judge if any more active intervention is necessary.

If it were possible properly to apply rest, careful exposure of the ulcers to the sun's rays, and real aseptic treatment to all our cases, this would without doubt be ideal, but in dealing with *jungly log* for the most part we must

do the best possible under the circumstances, and in our hands this method has given by far the best results.

### AN EASILY IMPROVISED APPARATUS FOR THE TREATMENT OF FRACTURE OF THE FEMUR.

By R. C. McWATTERS, M.B. (Lond.), F.R.C.S. (Eng.),  
LIEUTENANT-COLONEL, I.M.S.,  
Principal, Medical School, Agra.

THOSE whose duty it is to inspect village dispensaries are often shocked to find cases of fracture of the femur being treated on Liston's splint, none too well applied, with two or more inches of shortening and some rotation outwards of the foot. In district hospitals these cases are often treated with a Thomas' knee splint many sizes too large and the results are often lamentable.

Where suitable apparatus is not at hand fractures below the upper third may be efficiently treated with an apparatus which may be made in any village.

Take an ordinary lathi and tie it to the two legs of the foot of the bed, near the lower ends (Fig. 1). Take a board 4 inches wide, about two inches longer than the height of the bed, and about 1 inch thick. With the help of a carpenter cut a notch in the upper end and drill a hole from side to side as in Fig. 2. An empty cotton-reel is then fixed in the notch by passing a long round nail through the holes in the board and in the reel: this makes an efficient pulley.

The board is now tied to the foot of the bed and to the lathi as in Fig. 1.

The limb is then fixed in the usual plaster strapping extension and the cord is carried over

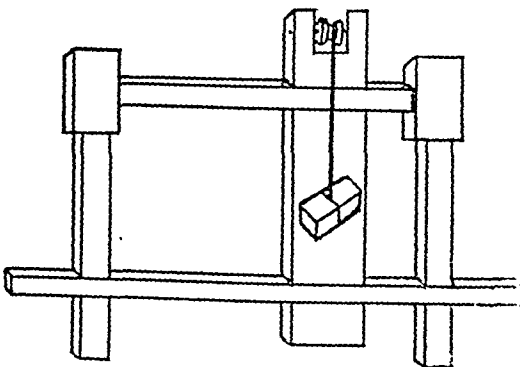


Fig. 1.

board further out towards the leg of the bed. Rotation of the limb is prevented as follows:

Wrap the ankle in cotton-wool. Place a thin board 3 inches wide and 12 inches long behind it, and at right angles to the leg; then fix it to the ankle by means of a plaster-of-Paris bandage applied in a figure of 8 around the board and the ankle. In hot weather an ordi-

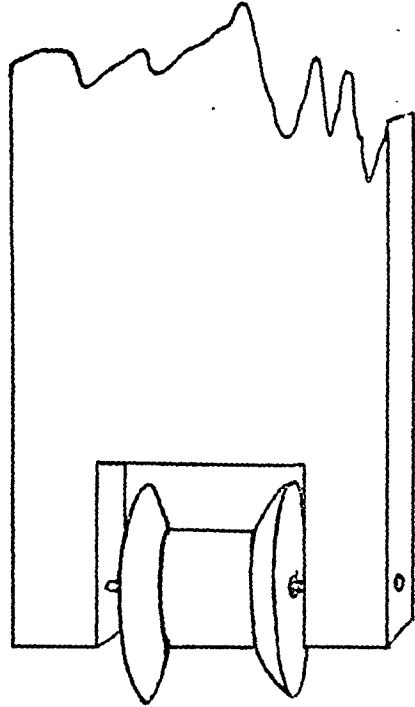


Fig. 2.

nary bandage may be used reinforced with a few turns of adhesive strapping.

It is not claimed that this is the best method. But it can be carried out anywhere, it is much better than an ill fitting splint and requires less skill to manage than more complicated methods. Shortening of the limb is exceptional and the chief objection is that painful disturbance of the fracture occurs when the bed pan is given. If the patient is restless a long Liston's splint is applied to the sound side.

The method was in general use before the introduction of Jones' and similar splints, except that it was carried out by means of special pulleys not obtainable in remote dispensaries.

### CHOLERA AND MALARIA.

By KARTIK CHANDRA BANERJEE,  
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THE treatment of malaria is very easy, but its diagnosis is frequently quite difficult without a microscope, as the complex clinical symptoms often puzzle the most judicious practitioner. Dr. Manson-Bahr remarks in his *Manual of Tropical Medicine*—"the use of the microscope must not be neglected in such cases if there be the slightest doubt as to their exact nature."

the pulley and attached to a weight of 4 to 12 lbs. according to the muscular development. Two bricks are placed under each leg of the bed at the lower end so that the patient may not be dragged down by the weight. Abduction, if required, may be obtained by fixing the



Again he says... "without the microscope its true nature may be hard to recognise." In June 1926, I too expressed a similar opinion in the *Indian Medical Gazette*,—"If the disease is properly diagnosed its treatment is usually straightforward, if otherwise, in the majority of the cases the results are bad." Differential diagnosis must depend solely upon the careful examination of stained blood films and in doubtful or confused cases this must be persisted in. The above will be justified by the following statement.

On 13th December, 1929, during the last cholera epidemic, I had to attend a female patient, said to have been attacked with cholera, and observed the following symptoms:—

Bile-tinged watery motions, extreme prostration, pulse thready and feeble, respiration laboured, intense thirst, tongue dry and coated, temperature 95°F., heart beats tic tac, spleen just palpable, urine suppressed for about 6 hours, liver and lungs normal, senses intact.

I took it to be a case of cholera yet in order to arrive at a definite diagnosis, (1) some excreta was at once collected in a sterile wide-mouthed bottle, (2) peripheral blood films were taken on two slides, and the following was prescribed.

Subcutaneous injection of:—

(i) Adrenaline chloride sol. 1 : 1000, 1 c.c.

(ii) Atropia sulph. gr. 1/100 in 1 c.c. distilled water were given alternately.

For oral administration:—

(i) Essential oils mixture, 4 doses to be taken every hour.

(ii) An alkaline mixture, 4 doses to be taken every 2 hours.

On returning to the laboratory the specimens were examined microscopically. The stool was negative for cholera vibrios, while innumerable malignant tertian parasites were seen in the blood film. Meanwhile I was again called in and found her condition still worse. Cramps of the muscles and extremities, profuse clammy sweat, restlessness, griping pain in the abdomen, voice sunk to a whisper, were the new troubles set in. Accordingly an intravenous injection of quinine bi-hydrochloride gr. X, in one pint of normal saline was given.

After a short while the temperature rose to 103°F.: this was accompanied by shivering, which of course ultimately subsided and in the course of an hour or so the pernicious symptoms exhibited a favourable turn (i.e., were of less severity). Four doses of quinine mixture were given orally every 3 hours.

On the 14th December, she was reported to be all right in all respects. Turbid urine was secreted at night, and the only complaint was headache and weakness. Four doses of quinine mixture, containing liquor arsenicalis and strychnine, were given, and milk for the diet.

On the 15th December, she had no complaint. Medicine and diet were given as on the 14th. On the next day she was all right, and allowed to have her usual diet. A mixture containing quinine, iron, and strychnine, and a bottle of cod-liver oil were prescribed, to be continued for at least a month. She regained her former health.

## SOME CASES OF SURGERY OF THE HAND.\*

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Case 1.—A young man received a bullet wound of the hand which penetrated the palm and fractured

the middle metacarpal. Some months later the extensor tendon was firmly attached to the bone so that the finger could not be flexed.

In such cases it is useless merely to free the tendon as the adhesions invariably form again. The following operation was therefore performed. A large flap incision was made so that the sutures should be well away from the affected area as a precaution against sepsis. The tendon was dissected away from the bone and a thin layer of fat derived from the thigh was placed beneath it, after breaking down some adhesions in the joints of the finger. After a week passive movements were begun and were gradually increased. The final result was almost full range of movement, the limitation that remained being due to adhesions in the metacarpophalangeal joint and no greater than was present at the time of operation.

The pad of fat in such cases adheres to both structures, but in time the fat is absorbed and is converted into lax tissue which allows of free movement.

There is no novelty in the method; it is described here because it is easy and almost universally successful and deserves to be more widely used than it is.

To avoid infection of the graft it is necessary to wait for several months after the original wound has healed, to keep the skin wound well away from the region of the graft and to avoid touching the parts with the hands, everything being done with forceps and other instruments.

Case 2.—In a lathi fight an elderly man received a fracture of the ulna and a severe contusion of the back of the hand. The fracture had been skillfully treated and had united well, but the fingers were quite stiff owing to widespread adhesions of the extensors. These were considered to be too extensive for treatment as above, so a malleable splint was made of thin sheet iron and by gradually bending it the fingers were slowly flexed. In the course of a few weeks a fair degree of flexion was obtained, but the result was by no means perfect.

I have seen several similar cases and the moral is that in severe contusions of the hand the existence of other injuries must never interfere with early passive movement of the fingers—otherwise the contusion will prove far more grave in its results than the associated fractures, though only the latter are at the time regarded as "grievous hurt." Being medico-legal cases, such patients make the most of their disability and give no assistance, and it requires some resolution and much assiduity on the part of the surgeon to secure a good result.

Case 3.—A European schoolboy developed a severe whitlow of the thumb. When this was opened up it was found that both phalanges were necrosed. The further treatment involved some interesting problems. With the loss of the bone the thumb would become a useless soft lump of flesh. In spite of free drainage the discharge remained profuse and pain and some fever continued. Amputation would have cut this short, but the boy was anxious to enter government service from which he would have been debarred by the loss of a thumb.

It was decided to treat the case just as one of necrosis of the femur. The dead bone was left in place to maintain the shape of the thumb in the hope that an involucrum of new bone would form. Regeneration of bone in the fingers is notoriously feeble, and I was unable to obtain any information as to whether it might be expected in such a case as this, but the youth of the patient was in his favour.

In two months' time regeneration was excellent and the sequestra were removed.

The basal epiphysis of the proximal phalanx had escaped, and with it the metacarpophalangeal joint—the interphalangeal joint was of course lost.

Healing was rapid and the boy has an ugly but very useful thumb with a fair range of movement at its base. He has since gained admission into government service.

(\*Being part of a clinical lecture delivered at the Agra Medical School.)

## Indian Medical Gazette.

MAY.

## PSITTACOSIS.

THE disease known as psittacosis has always been one of the curiosities of medicine, but the present widespread incidence of the disease in countries as remote from one another as South America, the United States, Germany, Switzerland, and Great Britain has naturally aroused the attention of both the medical and lay press. Psittacosis is defined by Dorland as a contagious influenza-like disease of parrots, communicable to man, and characterized in man by a typhoid- or paratyphoid-like disease associated with severe pulmonary symptoms and high fever. The literature in the medical journals for 1929-30 is already so extensive that it is difficult to summarize it, but as cases may have occurred or may be occurring in India, we may draw attention to it. The parrot has always been notorious for its language; its morals have always been under suspicion; it is now somewhat unfortunate for this domestic pet that it should also come under suspicion as a transmitter of disease to man.

Psittacosis as a separate clinical entity first appears to have been defined by Ritter in Switzerland in 1879, who drew attention to an apparent connection between small epidemics of pneumonia limited to certain houses, and an illness among parrots in the same houses. According to Castellani and Chalmers, a severe outbreak occurred in Paris in 1892; 500 parrots had been shipped from South America to Paris, and 300 of them died en route from enteritis. The remainder were sold in Paris, with the result that within 26 days an epidemic of the human type of the disease broke out, resulting in 49 cases with 16 deaths. The epidemic was characterized by being essentially a house disease. Smaller epidemics were reported in Paris in 1893, Florence in 1894, in Cologne and Paris in 1895, Genoa in 1897, in 1901 at Ancona and Hull, in 1904 in New Hampshire, U. S. A., in the same year in Boston, U. S. A., whilst small series of cases or isolated cases have been subsequently reported from time to time in the literature. In 1892 Nocard of Paris isolated a bacillus—the *Bacillus psittacosis*—from both avian and human cases of the disease, closely related to the *Bacillus paratyphosus* B. It was subsequently shown that this bacillus was probably identical with the *Bacillus artrycke*.

In the parrot the disease is essentially one of septicæmic type—often of hæmorrhagic type—with marked catarrhal symptoms and enteritis,

and is usually fatal. In man the disease almost invariably follows association with sick parrots, parrakeets, love birds, or finches after an incubation period of some 7 to 12—usually 10—days. The disease resembles typhoid or paratyphoid fever, but the onset is more sudden, with chill, high fever at an early stage, sometimes cervical rigidity, occipital headache, and coma. Epistaxis, rose spots, abdominal distension, and sometimes diarrhoea, are mentioned as complications. The most important feature of the disease in man, however, is its involvement of the lungs; this may commence as a "shifting bronchitis," but may go on to broncho-pneumonia, or to consolidation of large areas of the lungs. Convalescence is by lysis, and it is characteristic that the patients take a long time to recover normal health.

It is a little difficult to trace the origin of the present widespread outbreak. Taking the papers as they appeared in historical sequence, the first case recorded appears to have been the one reported by Dr. A. P. Thomson, which occurred in Warwick in July 1928. Enquiries showed that the patient, a middle aged Englishwoman, had purchased a parrot some weeks before her illness, and that the parrot had become ill and had died whilst being nursed by the patient; this bird was one of a consignment from West Africa, a large number of whom had succumbed to "parrot disease" after importation into Great Britain. In the same paper, the author records two further cases which occurred at a nursing home, associated with nursing a sick parrot; one of these proved fatal from pneumonia. A third nursing sister at the home had an unusual and very protracted attack of febrile bronchitis; these cases occurred between November 1928 and February 1929. It is noted that vomiting is frequently an early symptom of the disease, and delirium may be severe.

The main focus of the present outbreak, however, appears to have been the Argentine Republic (and it is curious to note that nearly all previous epidemics have been traced to sick birds imported from South America). About July 1929 an epidemic of what was taken to be epidemic influenza occurred at Cordoba, and Dr. Henry Barros showed its special association with a fatal epidemic among birds, especially cockatoos, most of which had been recently imported into the city. Within a few days the epidemic had spread to the neighbouring town of Alta Gracia; later it became widely prevalent in the city of Tucuman. In August-September 1929 it invaded Buenos Ayres, and hundreds of cases were reported. In October a party of actors was attacked, the death of a parrot which had taken the part of a sailor's pet in a play being responsible; there were 9 human cases with 2 deaths. Full clinical accounts of the disease as studied in man are given in *El Dia Medico* for the 23rd and 30th September, 1929,

by Dr. Henry Barros. Two special Commissions were appointed to study the disease, one by the Tucuman Hygienic Council in September 1929, and the other by the Argentine Medical Association.

From this focus the disease spread very widely in the autumn and later months of 1929. The S.S. *Arkona* arrived in Germany in November from South America and her cargo of parrots was distributed to Hamburg and Berlin. A considerable number of cases of psittacosis followed in both cities, with some deaths. In the meantime cases and some deaths were reported in January 1930 from Baltimore, New York, Maryland, and Ohio in the United States. In all instances it was established that the victims had recently purchased or handled parrots which were ill and soon died. In January 1930 Dr. J. S. Warrack described a case; the patient was a ship's carpenter who was landed sick at Gravesend on December 9th, 1929, from a ship from Buenos Ayres. He had purchased two parrots there and kept them in his cabin; both had died during the voyage. The serological findings were negative to the enteric group of bacilli, as well as to *B. psittacosis* and *B. artrycke* in all dilutions. No other cases occurred on board the same ship.

The bacteriological workers at the London Hospital now took up the study of the disease, and at a meeting of the Section of Medicine of the Royal Society of Medicine on January 28th, 1930, Dr. A. P. Thomson of Birmingham read a paper on the disease. He stated that since July 1928 he had seen 17 cases, of which 5 had proved fatal; all had followed the handling of sick parrots. Cheshire, Worcestershire and Warwickshire were the counties chiefly affected. In some cases, as the temperature fell by lysis, the patient's condition became worse and not better. The physical signs in the lungs might not clear up until the tenth day after the temperature had become normal. An interesting case was that of a Jewish girl who, according to Jewish custom, had been presented with two love birds on her betrothal. One of these birds was ill, and the girl developed psittacosis with severe consolidation of the lungs and a temperature of 104° to 105°F. for eight days. He recorded a fatal case in 1926 in a patient who had brought three parrots to England from West Africa, all of which had sickened and died of diarrhoea. A full clinical account of the disease is given in this most interesting report, and it is noted that the pulse is relatively slow, as in enteric fever; epistaxis may occur, sweating may be severe in the early stages, cough is frequent but not painful, expectoration is scanty or absent. Respiration is not hurried unless the extent of lung tissue involved is extensive. Agglutination to the *B. psittacosis* and the *Salmonella* group of bacteria is frequently absent, or, if positive, is frequently only transient. Dr. Robert Hutchi-

son of the London Hospital had seen 20 cases, of which 2 had proved fatal. The parrots concerned were nearly always green parrots. He had only rarely seen the dense consolidation of the lungs described by Dr. Thomson. Several other speakers took part in the discussion, and Dr. Western of the Bacteriological Department of the London Hospital reported that in 12 human cases and 6 infected parrots he had been unable to find any evidence of infection with any organism of the *Salmonella* group. By this time Germany had issued regulations prohibiting the importation of parrots into that country; the United States shortly afterwards took the same precaution.

In the *Lancet* of February 1st, 1930, Drs. S. P. Bedson, G. T. Western, and S. L. Simpson submitted a report from the Bacteriological Department of the London Hospital; they had been unable to obtain any bacteriological or serological evidence of infection with any organism of the *Salmonella* group, and had come to the conclusion that the disease was due to a filterable virus. Parrot tissues were still infective after being kept for 20 days in 50 per cent. glycerol in the cold. In the meantime other observers had reported that the faeces of infected parrots are infective, as also the dead birds, which should on no account be handled; and that the incubation period in imported parrots might be very prolonged. The virus will pass through a Chamberland LI filter.

In an editorial comment in February 1930, the *British Medical Journal* drew attention to the disease, but noted that there were no grounds for apprehension; also that the London Zoological Gardens had remained entirely free from infection. In the same month the *Lancet* gave an account of the outbreak in Germany; two small outbreaks had involved three members of a family which traded in imported animals, and the other the staff and patients of the St. Gorg Hospital in Hamburg. There were 9 cases in these two outbreaks. Fourteen cases had occurred at Barmbeck. A third outbreak occurred in a household in Berlin, a member of which had brought back four birds from the Upper Amazon, three of which became ill; there were 2 deaths and 3 recoveries in this household. Still another small outbreak affected six persons who had come into contact with a sick parrot. The bacteriological findings had been completely negative, and the German, equally with the British, investigators considered that they were dealing with a filterable virus, and that the *B. psittacosis* was not the aetiological agent of the disease.

In the *Medical Clinics of South America* in January 1930, Dr. J. Sailer described a further case which occurred in Pennsylvania. He notes that the sick parrots crave water to drink incessantly, that they suffer from severe diarrhoea, will not eat, and droop. The feathers are ruffled and easily fall out. A parrot which has

apparently recovered from the disease may suffer from a relapse. In man there is leucocytosis, and the urine may show albumin and pus cells. Blood agglutinations were negative, and no organisms of the enteric group could be recovered from the fæces. Cocaine and adrenalin applied to the nasal mucosa relieve the distressing headache, whilst ammonium chloride should be given orally.

The second bacteriological report by Drs. Bedson, Western, and Simpson was published in the *Lancet* for February 15th, 1930. It confirms fully that the virus of the disease is a filter-passing organism. In only one bird out of six examined was the *B. ærtrycke* isolated, and here the lesions present at post-mortem examination were entirely different from those in psittacosis. Eight budgerigars inoculated with citrated blood from human cases all became infected, and from two of them filtrates of suspensions of the liver and intestine proved infective. The epidemiological evidence tended to some extent to show person-to-person infection without the intermediary transmission by birds. A human case occurred from the bite of a parrot which had been ill eleven months previously, had recovered, and had shown no symptoms at all except for occasional attacks of diarrhoea in the interval. Pigeons and guinea-pigs proved resistant to the virus, but fowls are susceptible, and the question of the relationship of psittacosis to "fowl plague"—which is also due to a filterable virus—is raised.

In February 1930 Dr. Mary Radford contributed a detailed clinical account of a further outbreak in a family at Oxford. The two sons of Dr. and Mrs. M. imported a green parrot on December 21st, 1929, which arrived ill on a very cold day, and died on December 30th. In all 8 persons were more or less in contact with this bird, and 5 became infected. This paper contains temperature charts of the disease and much clinical information with regard to it; the illness was severe in all cases; two patients showed a clinical picture very suggestive of typhoid fever, and three had lung complications, but in no case was there the solid condition of the lung described by Dr. Thomson of Birmingham. In one case where bacteriological tests were carried out the results were completely negative. The blood gave no agglutination to any of the organisms of the typhoid and dysentery group, including the *B. ærtrycke* and the *B. abortus*.

Finally comes an extremely detailed and valuable paper on the disease by Dr. A. P. Thomson and Dr. W. T. Hillier in the *Lancet* for February 22nd, 1930, which is quite the most complete account yet presented in the literature. This refers to no less than 21 cases, of which 19 were clearly cases of human psittacosis, and 2 were also probably due to that

disease. The authors give the following general clinical account of the disease:—

"It is fairly accurate to say of the severer cases that they resemble typhoid septicæmia in retaining a slow pulse, despite a high continuous fever. Even before the development of the unusual pulmonary signs, however, certain features distinguish them from true typhoid; the onset is usually more sudden and the temperature rises more rapidly. Headache is intense, generally occipital, and often associated with slight cervical rigidity. Epistaxis occurred in one patient. Sweating was sometimes severe. Diarrhoea and vomiting sometimes occur in the early stages, but as a whole the alimentary symptoms, apart from distension, have been trivial, except in the case of the three children. The spleen became palpable in one case, and then only for a few hours; no rose spots have been observed. In one case a typhoid-like relapse occurred. The outstanding feature of the clinical picture is the involvement of the lungs. At the onset signs of slight shifting bronchitis appear, to be followed in a few days by those of extensive consolidation manifested by impairment of the percussion note and the presence of tubular breath sounds. Still later the percussion note becomes completely flat, and breath sounds in the affected area disappear. The curious silence of the lungs may persist for some days after the temperature has fallen and the general condition has improved. A whole lung may be affected in this way. Resolution occurs very rapidly and completely, and is accompanied by fine crepitant rales. Repeated explorations of the chest have shown that these signs are in no way due to pleural effusion..... Certain negative features in the respiratory condition are important. Although cough is frequent and at times incessant, it is never painful, and expectoration is scanty and frequently absent; only twice was any rusty sputum obtained. Respiration is not hurried unless the area of lung involved is very extensive; it was easy and never 'pneumonic' in character. Pleuritic friction was found only once..... A diagnosis would be frankly impossible unless the history of contact with sick birds were elicited."

The authors then go on to discuss the bacteriological findings. In only one case did they isolate a bacillus corresponding to the *B. psittacosis*; on the other hand Professor C. J. Lewis reports that this organism was isolated from the cage of three of the birds responsible for this outbreak. Also positive agglutination results may be obtained. The authors therefore refuse to give a definite opinion as to whether the disease is due to a bacillus of the *Salmonella* group or to a filterable virus. Clinically, they claim, the disease is a separate entity with a very definite clinical picture of its own. Bacteriologically, its ætiology remains to be proved.

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We trust that the above abstract gives a fairly detailed account of the present knowledge of psittacosis, as far as the literature to date has been studied. A further problem arises however. A mysterious epidemic malady of fowls, known by such various names as "Newcastle disease of fowls," "pseudo-fowl pest" of the Dutch East Indies, and "avian plague," due to a filterable virus, has long been known. Since about the middle of 1927 this disease has been very prevalent in India, and was first reported from Ranikhet in the United Provinces and Tanjore in the Madras Presidency in India about that date. This disease

(which has been found to be exceedingly prevalent among fowls purchased for experimental purposes at the Calcutta School of Tropical Medicine) has been widely epidemic in India during the last two and a half years, and has been the subject of special investigation by the workers at the Imperial Institute of Veterinary Research at Muktesar. The disease almost invariably proves fatal, and causes severe epidemics in fowl runs. The infected birds die in about 48 to 72 hours after showing the first symptoms of the disease; just before death they are almost completely paralysed and unable to stand, and a glairy mucoid secretion dribbles from their beaks. Ducks and pigeons are usually resistant, though they can be infected artificially. Mr. H. Cooper, M.R.C.V.S., of the Imperial Institute of Veterinary Research at Muktesar, has found that the serum of birds which have recovered from this disease has a most efficient protective action when inoculated into susceptible birds, and is at present engaged on an experimental enquiry into this "avian pest," as the disease is usually termed. (The disease is quite different from avian Pasteurella infection, and blood cultures remain sterile.) Crows are very susceptible, and possibly the unusual mortality noticed among crows in Bengal and the adjacent provinces in 1929 was due to this disease.

It will be noticed that Bedson, Western and Simpson have raised the question of the possible relationship of psittacosis of parrots and other birds to "avian pest"—both diseases being due to a filterable virus. The present world-wide outbreak of psittacosis is certainly the most important that has ever been recorded, and the investigations with regard to it are likely to contribute materially to our knowledge with regard to diseases due to filterable viruses. Whether cases of psittacosis have or have not occurred in India one does not know; it seems unlikely that the infection should have been imported direct from South America into India in the form of infected parrots. On the other hand, "avian pest" is at present extremely prevalent in India, and perhaps the workers in this country may be in a position to assist in the general world-wide enquiry. The present outbreak of psittacosis appears to be unique in history and to afford to medical research workers in several different countries unique opportunities of solving the problems concerned with this curious disease.

R. K.

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\* Report not studied in original.

## SPECIAL ARTICLES.

### THE POSITION OF PSYCHOLOGY IN THE TEACHING OF MEDICINE.\*

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I do not think that any practitioner of medicine would maintain that the great developments in medical science during the last 100 years have brought about therapeutic successes commensurate with the increase in our medical and surgical resources. In other words, medicine continues to fail in its attempts to deal successfully with a problem which is its special concern. One of the consequences of this is that there exists among the public a considerable mass of ill-will against the medical profession, as well as a steady increase of fraud in every branch of therapeutics. Many doctors, probably the majority, will say that this has always been so, and, in all probability, always will be so. Although there may be good ground for adopting this attitude, no one could argue that the medical profession as a whole is entirely indifferent in these matters. Throughout the world there exist medical organisations to restrain the activities of unqualified practitioners, and to regulate the curricula of medical

\* Based on a paper read before the Medical Section of the All-India Science Congress, January, 1930.



teaching. But in spite of these precautions, the quack flourishes and consulting rooms are full of people seeking for the relief they never find. Obviously there is something wrong somewhere and, I maintain, it is our duty to try and locate and identify the source and nature of the trouble. To the psychologist, perhaps inevitably, the idea will at once occur that part of the trouble at least may lie in the fact that medical practitioners have always shown a curious disinclination to attach any importance to the Hippocratic injunction always to pay strict regard to the mental as well as physical aspect of disease, when diagnosis and treatment are under consideration. One result of this neglect has been to lead medical practitioners more and more to treat a phantom man and to ignore the real man, that is, a living organism composed of a mind as well as a body. Further, the enormous accretion of knowledge through the development of scientific research has favoured this procedure so that we find nowadays the most elaborate specialisation in medical practice, with its inevitable tendency to regard a man as something made up of bits of things like what the anatomists show us in the dissecting room or what the histologists show us under the microscope. These so-called specialists seem quite satisfied to ignore the fact that each discernible part of a man is inextricably interwoven with every other part so that failure of function in one or more of the parts must involve repercussions throughout the whole organism. To the psychiatrist this attitude towards disease is incomprehensible because he knows something of the central nervous system, with its sympathetic and para-sympathetic systems. He knows (or he should know), something of the work of Cannon on bodily changes brought about by certain strong emotions. Last, but by no means least, he knows by his study of the ætiology of diseases like conversion hysteria, how a mental conflict can appear as a physical symptom. A good many years ago, when I was a medical student, I was greatly impressed by a remark of an old and deeply experienced general practitioner who said that it is not so important to know what sort of disease a patient has as to know what sort of patient has a disease. Although this view may strike some of our modern practitioners as thoroughly cynical, I would like to point out that it nevertheless contains an immensity of wisdom in that it embodies the quintessence of therapeutics, namely, that the concern of medical practice is not with diseases but with diseased people. To emphasise the great practical importance, apart from the scientific validity, of never failing to treat the diseased organism as a whole, mind as well as body, I will quote an example or two from my own experience. Some years ago, I had occasion to consult an eminent London physician about a peculiar type of furunculosis from which I was

then suffering. He prescribed ionisation. I begged him to suggest an alternative because, as I explained to him, even the mildest electric shock causes me considerable distress. He pooh-poohed my protest on the ground that the electric current would be so mild I should hardly feel it. In the end I had to give way and the treatment began. My physician's own nurse arrived with the apparatus and one of my arms was placed in a basin containing a solution. I warned the nurse to keep the electric current very weak and she agreed to do so. All went fairly well for a few moments although I was in an agony of apprehension. Suddenly the nurse increased the current very slightly, but this slight increase was too much for me. I plunged as if I had been tetanised. The contents of the basin went all over the nurse and the battery got such a kick from me as to send it flying across the room. Now none of this need ever have happened had this eminent London practitioner been aware of the Hippocratic principle to treat patients and not diseases. Because he preferred, and that too in spite of a warning, to treat boils instead of a man with boils, he procured his nurse a warm saline bath and had his battery broken, not to mention making me worse than I was already for he put me in a thoroughly bad temper.

Let me take another instance. Some years ago I was asked to treat an elderly unmarried Englishwoman for a severe psychosis. In the course of the examination of her physical state, I was astonished at the number and size of the scars left by surgical operations on her abdomen. I found out in due course that my patient had been a very attractive girl and had been engaged to be married six times to five different men; twice to the same man. Each engagement had lasted only a short time when she broke it off and became seriously ill. On each occasion she was admitted into hospital and underwent a laparotomy. Two of the surgeons who operated on her were men of high reputation, while the others were of only average competence. Now not one of these surgeons seems to have suspected there was a mental factor in the case; they just "treated" the abdominal conditions. But had any one of these surgeons been taught to take the Hippocratic standpoint as his starting place for a diagnosis, he would almost certainly appreciate the true significance of the situation and referred his patient to a psychiatrist for a further opinion. I feel certain that had this girl been seen by a competent psychiatrist in the first instance, she would have escaped the development of the psychosis in which she eventually ended her life. I have little doubt in my own mind that these illnesses were the product of a strong feeling of guilt; in other words, they were self-inflicted punishments, for when I taxed her with this point of view she was extremely indignant



and rushed from my room, violently closing the door after her in such a manner as to pinch severely one of her fingers in the jamb. Hearing her cry out with pain, I followed after her and asked what had happened. She held out for my inspection the third finger of her left hand. "Why," I said, "you have gone and punished yourself again. You have pinched the finger on which you will never wear a wedding ring."

This case leads me to mention another type of trouble which is frequently puzzling to the ordinary practitioner. This is a peculiar variety of so-called "accident" which may result in any form of injury. The striking feature of these "accidents" is that the injured person, so far from being distressed at what has happened, seems quite resigned, indeed, sometimes almost pleased. Now anyone who undertakes to examine into the history of such accidents, will surely find that the patient either made no attempt to save himself, e.g., from falling, or had taken pains to get into a dangerous situation. Here again we are dealing not with accidents in the usual sense, but with self-inflicted punishments motivated by a strong sense of guilt. Of course, the proper treatment in such cases is to treat the feeling of guilt as well as the actual injury.

Now what is the remedy for all this muddle and waste? I believe that the remedy lies in a thorough overhaul of our existing methods of teaching medicine, with the cardinal purpose in view of re-establishing the importance of the mental side of the organism in the aetiology of disease as well as in therapy. That medical practitioners, with the exception of psychiatrists, are profoundly ignorant of psychology, ceases to be a matter for surprise as soon as we realise the place psychological medicine takes in our medical curricula. Psychological medicine, if it appears at all, does so as a more or less elaborate course in formal psychiatry, although one might have presumed that a moment's reflection would have been enough to show that the ability to differentiate types of dementia or to diagnose between manic-depressive insanity and general paralysis, is not the best equipment for any type of medical practitioner except a specialist in mental alienation.

To achieve therefore anything approaching a sound medical curriculum, we must scrap forthwith the whole of the existing programme in formal psychiatry and replace it by another which is not only basically scientific but of practical utility. To begin with, I would suggest a simple course of instruction in normal psychology. To follow this I would recommend two alternative courses, one for medical students who intend to make psychiatry their special study, and another for those who intend to take up general practice or to specialise in any branch of medicine or surgery, including dentistry. This latter course would comprise a

training in the aetiology of the neuroses as well as a study of the mental correlations of physical disease. Special emphasis would be placed upon the common psychic reactions associated with impaired function of the eyes, nose, teeth, heart, alimentary canal and genital organs. For example, the attention of students would be directed to the interesting observations of Inman on the mental aspect of defects in visual accommodation, photophobia and strabismus. A good number of oculists would be astounded to find how often the habit of wearing deeply tinted glasses is founded on an intense fear of darkness in childhood. Similarly the unconscious association of the nose with the penis as illustrated by endless vulgar sayings and jokes, will often lead to an anxiety about a possible venereal infection or a diminution in sexual potency, expressing itself in an anxiety about the condition of the nose. Not long ago, I was treating a female patient who had spent quite a small fortune in visits to rhinologists on account of a mild chronic rhinitis, when a careful examination into her case revealed that the anxiety about her nose really belonged to her clitoris. In like manner, anxieties about the condition of the mouth in women often disclose a transference upwards of an anxiety about the vagina. Here again, folklore and the sayings of common people show how closely are the mouth and vagina related in the mental sphere. It would be necessary to outline the symbolic significance of the extraction of the teeth as a punishment for masturbation for the better instruction of dental surgeons. The heart, that organ *par excellence* of mental repercussions, has almost a psychology of its own due to its deep and age-long association with the feelings of love and passion. Indeed, a very superficial acquaintance with the anxiety states is sufficient to show how intricate is the mental aspect of cardiac disease. Then the alimentary canal provides a rich field for psychic repercussions, especially as regards the acts of vomiting and defaecation. But perhaps the most important of all are the genital organs, especially those of the female. To psychiatrists the ignorance of the ordinary medical practitioner and even of many gynaecologists of the mental repercussions of disorders of the female pelvis and genital organs, is positively staggering. Many gynaecologists perform double ovariectomy, hysterectomy and salpingectomy without, it would appear, realising that a final and irrevocable prohibition to the consummation of the biological destiny of a woman is an affair not to be lightly undertaken. Then in respect to such conditions as vaginismus and dyspareunia, the most amazing remedies are applied without a thought that the condition may be entirely psychic in origin as, indeed, it nearly always is.

I will conclude with a few remarks on the psychological aspects of certain forms of

therapy. I have alluded already to the objection to employing electrical treatment to persons of certain psychic constitution. Massage is a form of treatment which may be highly offensive to chaste women who have erotic feelings when their skin is touched. Likewise, the use of syringes, hypodermic or otherwise, may be, and frequently is, very repugnant to some female patients and to certain types of homosexual men. The syringe and its action is for them too closely reminiscent of the male organ and its functions. Then it should never be forgotten that any kind of medicine in the form of a draught is frequently associated in the unconscious with semen. Hence the objection some women have to taking medicine by the mouth as well as the fondness of others for so doing and the habit some women make of keeping the prescriptions of their favourite doctors.

I have little doubt that much of what I have stated will meet with incredulity if not with derision. The only reply I can make to those who would either disbelieve or deride is: "Don't laugh at me. Just try for yourself and see what happens."

#### THE SCIENCE OF DISEASE.\*

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(Being the presidential address to the Seventeenth Indian Science Congress, Allahabad, January 1930.)

YOUR EXCELLENCY, LADIES AND GENTLEMEN,

Before coming to the subject proper of my discourse to-day I have the pleasant duty to perform of welcoming all of you here to the 17th Meeting of the Indian Science Congress. Unlike some Scientific Congresses that have been held in India the Indian Science Congress is in inception and scope one intended primarily for India's own scientific workers. It is therefore worthy of our fullest support and of our efforts to make it as great a success as possible. I need hardly point out the high position India has taken in many scientific subjects. In physics, chemistry, zoology, botany, geology, agricultural science, meteorology, medical research and other branches of Science Indian workers have added considerably to the sum total of the accomplishments of science, and I feel very deeply the honour of addressing this audience in which a number of those who have taken part in this work are present.

I found myself at first in some little difficulty to decide upon a subject that would be appropriate. It seemed most natural to speak on some medical research subject with which I was specially conversant. But this was perhaps too restricted a view to take for such a gathering as the present in which all sciences are represented and I sought for some general question that might interest you. Yet when I began to venture into realms that were not my own I felt a certain trepidation, since specialization now makes it very difficult for an ordinary person to speak without danger of tripping in any subject but his own. Eventually I decided not to roam too far, untrammelled by that strictly professional knowledge which many of you here possess in your own subject and, still

within the safe bounds of my own general territory, to give you a brief sketch of the nature of the field covered by medical research, or as I prefer to it here the science of disease. Coming as medical research does into close relationship with many sciences, each of you may possibly be interested in at least some part of my remarks. I was the more supported in my choice when I remembered that there is a general interest taken in matters of health and disease and that, perhaps if I failed to interest you as experts in your own particular science, I might still possibly approach you on a subject of general public importance and interest.

At the bottom of all questions of health, of curative or preventive medicine, or of medical art lies the necessity of knowledge of the causes of disease. The science of disease is therefore the very root of medical research. We cannot know what is required to maintain health until we know what may cause departure from this, and we cannot usually cure or prevent without knowing how diseases are caused. It is because just this knowledge, so simple when attained, so overlain in incredible secrecy until so attained, is so difficult and precious to come by, that medicine has had such an uphill fight. It has been both medicine's trial and honour that the subject it has had to deal with is not simple and straightforward but bound up with what, even in this present day, are among the most advanced developments of science. Its chemistry as we now realize is mainly colloidal chemistry since living matter consists of colloids, its biology lies in the subtlest regions of parasitology and the host's reaction to invasion, its physics deals with the electric charge of proteins and such like things.

Just as astronomy is the science of the stars, biology the science of living things, and seismology the science of earthquakes, and so on, there is clearly a science of disease, though curiously enough it seems to have no name. Nor is this science unimportant, or merely altogether the application of other sciences. It has its own field, its own techniques and its own extensions into high matters, which cannot strictly be put under chemistry or biology any more than can astronomy be usefully considered as merely physics.

I propose then briefly to indicate the role of this science, including its practical importance to mankind, to give a very brief history of its growth and development, to describe some of the features of its modern progress that have especially so far seemed to lead to advance and, lastly, I shall go on to some lines of development in which medical research has advanced into fields which are peculiarly its own and in which, though its methods are, as they must be, those of the sciences physics, chemistry, biology and the like, it would appear to have trodden new or unexpected ground.

#### The Role of Medical Research.

The enormous practical utility in human life of a knowledge of the cause of disease is undoubted. It is often said of progress in an individual career "What serves it if a man gains the world and loses his own soul." A somewhat parallel case could be made regarding the enormous advances that have been made in human progress depending upon mechanical and other sciences. Without the means to control disease humanity lies helpless and open to attack. The conquering hero dies of cancer, the powerful emperor is sick of a fever. Disease is the most remorseless, the most cruel, the most continuous in its action of any of the great physical ills that threaten and control mankind. Of the three great terrors sword, famine and pestilence—pestilence, if we mean by this disease, has easily first place. War, at least now, in any given country is temporary, famine is episodic, but disease is ever present.

This may sound an exaggeration, but probably few but medical men fully realize the terribleness and cruelty of disease. Insanity, ulcers, pain, blindness, deformations, it is all misery. It is often the fashion

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with those who do not see much of real disease, as for example that curious body the Christian Scientists, to speak of disease as though it were a merely something a little irregular, a lapse in mental health. But though this may be the view of the fortunately healthy it is not the picture seen by those whose business brings them into close contact with real disease. It would be a terrible thing if the boon of anaesthetics, the reliefs of surgical and medical treatment had never been developed as they are now. Further, to disregard the individual and think of disease as affecting communities it is easy to picture what forces of disorder and death might at any time make their appearance, populations ravaged by plague and ignorant of its cause, civilizations destroyed by malaria and knowing not whence it came, men marching athwart the prevailing wind to escape cholera which they carried with them as used to be done. All such thoughts show what a necessary science is the one we are discussing. But for many, many centuries the necessity was seen, but this did not help knowledge.

#### *The History of Medicine.*

The history of our science, if in these early days one could call it a science at all, takes us back a long way. Reference to medical subjects occur in the Vedas at a date estimated to be as early as 1500 B.C. Singer draws attention to an early Egyptian medical papyrus of about 1700 B.C. There are also Mesopotamian and Minoan origins. It is usual to commence the story of medicine with Hippocrates. Hippocrates was a Greek physician born in the island of Cos off the shore of Asia Minor. But the source from which knowledge of Hippocratic teaching is derived is the so-called Hippocratic Collection, about 100 books by different authors belonging to different schools and periods dating from about the 6th to the 4th centuries B.C.

The Hippocratic school taught that the body possesses four humours, the blood, phlegm, yellow bile and black bile, a right proportion of which constitutes health and an improper or irregular distribution disease. About the real causes of disease one is safe to say nothing was known. It should not surprise us that the Hippocratic school, or indeed any ancient system, did not penetrate into the real portals of the causation of disease. For 2,000 years afterwards no further progress in knowledge was made and indeed there was for a long time retrogression. So much so that when with the revival of learning in Europe the authentic text of the old Greek practitioners of the Hippocratic school was made available these ancient writings had a very great effect in revivifying the study and practice of medicine. The humoral theory of the Hippocratic school had as much to be said for it and as little to be said against it in the 16th century A.D. as in the time of Hippocrates.

A great name in the history of medicine was Galen (130—200 A.D.). Galen developed the idea of Pneuma (spirit) penetrating all parts of the body and mingling with the "humours" in different proportions. He held the theory of "temperaments." The normal condition or temperament of the body depended upon a proper mixture or proportion of the four elements—hot, cold, wet and dry. At this time it was believed that combinations of these elements produced the visible universe, i.e., hot and wet made air, hot and dry fire, dry and cold earth and so on. In drugs were to be recognized the same elemental qualities, hot, cold, moist and dry, etc., and so came indications for their use. Galen's explanations and system passed down through the ages as accepted facts. Throughout the middle ages beliefs about physiology and hence disease were always based on Galen. A thousand years later men hesitated before they contradicted even some detail of Galen's dicta. The views of this authority were not the truth but he had a logical mind and he unfortunately explained things so well that everyone was satisfied. One wonders how much we may sometimes be doing the same thing at the present time.

Arabian medicine, i.e., the medicine which arose in the chief seats of the Moslem power in the Mahomedan Empire was a return in a sense to the old Hippocratic medicine, for the writings of importance are chiefly based on translations of Greek books into Arabic carried out under the Abbasid Caliphs at Baghdad. The Caliphs were attached to ancient learning, they collected manuscripts and had these translated by the most competent scholars they could attract to their court. Actual advance made was chiefly in the form of pharmacy and therapeutic uses of drugs. Islamic medicine was the medicine of Europe in the middle ages and remained so till replaced by other systems based again on the old Hippocratic and Galenian systems.

Science which had its beginnings in the 17th century was some time before it effectively assisted medicine. Looking first for the somewhat simple types of explanation to which it had grown accustomed, it rather tended to create more fallacies of the old type than real progress. Even when anatomy and physiology, mechanics, chemistry and the like had progressed some distance they had little real help to offer the difficult, intricate and complicated issues which, had they known it, were necessary to be dealt with in the science of disease. Even in the 18th century strange "systems" prevailed. The Brunonian system explained the processes of life and disease as due to the property of "excitability" in virtue of which the "exciting powers" called forth the vital phenomena of "sense, motion, mental function and passion." All exciting powers are stimulant. So diseases were recognized as sthenic or asthenic, the latter requiring stimulant treatment, the former sedative. Another system which arose in this time was that of Hahnemann, generally known as homœopathy, a name one is still familiar with.

It is with relief that one turns from all the endless machinations of the introverted human mind in these early times to the beginning of real progress based on scientific method. It would take too long to follow step by step what now happened in decades where previously one has been dealing with centuries, if not millenia. I must merely indicate a few or some of the major advances made when science at last entered the field.

Up to this we should remember that until the end of the 18th century no one knew that there was such a material thing as oxygen. No one up to the middle of the 19th century knew really anything of the microbic origin of disease, though as often happens a sort of theoretical deduction had been put forward in advance of actual knowledge. A Veronese physician, Frascatoro, held a theory which must at least be considered correct so far as it went, viz., a rational theory of infection in which he hypothesized minute bodies with the power of self-multiplication.

In 1615 Harvey discovered the circulation of the blood. About 1650 a way was found of constructing and mounting simple lenses of high power. In 1661 Malpighi by the aid of such lenses discovered the capillaries. In 1761 Auenbrugger introduced the stethoscope and Laennec (1781—1826) developed the application of so-called physical signs in medicine. In 1796 Jenner showed the protection given by cow-pox against smallpox and opened up the subject of immunity. Schwann (1839) and others showed the cellular nature of animal tissues and laid the first foundation of histology, cytology and much else. Pasteur (1822—1895) laid the foundations of bacteriology and Lister (1861) of aseptic surgery. Anaesthesia came into surgery in 1846 with the use of ether by Morton and (1847) chloroform by Simpson. In 1876, Koch demonstrated the microbic causation of many diseases and began the study of disease causing organisms as things which could be seen, described and grown.

Taking 1518, the date of the death of Leonardo di Vinci, who was the first to question the views of Galen as the very beginning of the new order of

things, we have by 1880 or in about 250 years progressed from the stagnation of two millenia and the unchallenged supremacy of Hippocratic medicine of 300 B.C. practically into present-day conditions, where in theory and execution medicine has become one of the greatest, though still almost, if not quite, the most complicated and difficult of all sciences.

#### *Features of Modern Progress.*

So far the underlying note had almost always been "cure." Early medicine was concerned primarily and almost single-mindedly with cure. With many even at the present day the idea of cure as the role of medicine predominates. It is only relatively recently that the importance of prevention in the individual and in humanity in the mass has come forward.

Another feature of modern and especially of preventive medicine that is called to mind by the discussion of the predominance of the immediate utilitarian idea of cure is what is very aptly put by Singer in his short history of medicine as the recognition of the "fallacy of the frontal attack." Many would have us picture as the highest ideal that of the worker who sets out to obtain a cure for some terrible disease. This would no doubt be a very worthy and high motive, but it is doubtful if to the world at large it is likely to be as effective as the perhaps more selfish but in the end more productive following of science for its own sake. Medicine, still an art, advances only on a basis of science. Its votaries and certainly its scientific staff would be wise to bear in mind one of the peculiarities of science, viz., that from apparently the most seemingly and almost apparently trivial discoveries have come the greatest benefits. Koch would never have seen the tubercle bacillus, nor indeed any of us, if men from the love of science for its own sake had not engaged themselves in those, what must have seemed in those times trivial, studies that resulted in the creation of the modern microscope, without which it is I think legitimate to say that no science of disease could ever have originated. Hence in the modern development of medical research the field must be wide, curiosity, that trait in human character which is the most powerful opener of secrets and apparently the key to the dominion of man over Nature, must point the way. This again raises issues which I do not propose to enter into here, which are nevertheless very important in the question of medical research administration.

The time which I can expect you to give me is limited and I must pass somewhat more rapidly if I am to cover the ground intended.

As Colonel Mackie has said in his excellent resume of Medical Research in India,\* in medicine men at first depended on the unaided senses and such clinical and epidemiological observations as could be made without any very special outside help. With the microscope and delicate chemical and other tests there evolved the pathologist, bacteriologist, protozoologist, biochemist, parasitologist, entomologist and so on. This specialization is becoming increasingly inevitable and its degree more pronounced owing to the vast field which even a single one of these sciences embraces.

The evolution of medical research has followed these lines in all parts of the world but nowhere so remarkably as in the tropics where disease like vegetation flourishes in some sort of relation to temperature. The greatest outstanding feature in tropical medicine is perhaps the enormous advance in parasitology and the transmission of parasitological disease. All this advance has been for the most part very recent, in what may almost be called the Recent or Holocene Period, of our subject, speaking geologically, which may be said to start from the electrifying discovery by Ross that that age long mystery, the method of entry into the human body of the parasite of malaria, was after all only a special case of heteroxeny, by a parasite belonging to the class Sporozoa.

So enormous has been the development in tropical medicine in the 30 years that have elapsed since that epoch-making discovery that it is quite impracticable for me to sketch even in outline what has been achieved in any detail. I shall do better to consider in broad outline what has been the general effect of this advance on our special science, the science of disease.

To those actually concerned with the prevention of disease nothing becomes clearer than that any effective action against a disease is almost absolutely dependent on the knowledge of the means of causation. A good example is plague. Formerly plague was viewed in the light of a directly infectious disease. Thus sanitary cordons and such like measures were those first enforced. When the idea of microbic infection had gained ground indiscriminate disinfection was added. How many thousands of gallons of disinfectant, often quite unsuitable to destroy insect life, must not have been thrown broadcast killing only harmless saprophytes while real infection lurked in the living rats and fleas in safe retreat. To a demon it must have appeared like some grim game of blindman's buff, men seeking to destroy by blind indiscriminate ineffective action what, if they could have seen, they could have picked out selectively for elimination. A human case of bubonic plague we now know is comparatively harmless, the real danger lies in the epizootic conditions that infect the area and hence evacuation rather than cordons and disinfectants to destroy fleas rather than microbes, usually a different kind of chemical altogether, are the proper things to use, and further and more fundamentally, we know there should not be such habitations as are suitable to infestation by rats or places where grain is kept that are not rat proof and so on. The same exactly has been the case with malaria. People believed they were inhaling miasma, all Nature as it were exhaling a poison, when in reality the source was concrete, a little fragile mosquito that individually could be crushed with ease and against which any individual with reasonable care can completely protect himself. We do not fear malaria now when we are in the primeval swamp, but when we come to our camp amongst other humans who have the disease.

Further it is not enough to know only the broad fact of how a disease is transmitted. We must know every detail in such transmission. We must know intimately the life histories of mosquitoes, fleas, lice and other insects, the resistance of organisms to desiccation, to chemical substances and so on. We must know not only that some disease is due to faulty diet, for not all diseases are transmitted, but we must know with exactness the chemical and other characters that are lacking.

We now know pretty effectively the causation and details of transmission of plague, malaria, filariasis, typhus, relapsing fever, beriberi, leprosy, enteric, hookworm anaemia, schistosomiasis and numerous other diseases.

#### *Relation of Medical Research to other Sciences.*

All this has not come about without a great deal of drawing upon sources outside medical research proper, if we think of this as purely medical work, nor has it all been done by medical men though these have done a major share. Many workers in medical research are chemists, many not only use biological methods but are to all intents and purposes biologists. Specialization may in present times be considered unfortunate, but it is only fair to say that in this way only can the worker in one line get what he wants when he has to rely upon the services of another. It is often the fashion to make disparaging remarks about the dry as dust systematist, the man who counts the very hairs on an insect's tail, yet scarcely a move can be made without his tremendous knowledge of details in his own sphere, more and more the technique and methods of entomology, helminthology, protozoology, bacteriology, colloidal and physical chemistry and other sciences are found necessary.

\* Souvenir. The Indian Empire. 7th F.E.A.T.M. Congress, 1927.

Medical research, dealing as it does with departure from the normal conditions of the body, has obviously a relation to physiology. Largely through the effects seen in disease has come our knowledge of the functions of the ductless glands and the part played in the physiology of the body by the secretions of these glands or hormones. Again in nutrition it is largely studies directed against disease which have made us familiar with the effect of the vitamins and of radiation in the maintenance of the normal functions of nutrition.

With biology medical research is very closely associated. The fact, that many diseases are due to parasites, has led to very close study by medical research workers of groups of organisms that otherwise might not have received such minute attention. The science of bacteriology which deals with a whole range of organisms, which we now know to play a tremendous role in Nature, arose largely in the beginning from a study of the cause of disease and this science, in one sense a branch of biology, is still very largely dealt with by medical science. The same with the protozoa, especially the great parasitic groups Sporozoa and Flagellata. The life histories of some of these, puzzles that have taken endless work to unravel, would scarcely have been revealed to us had their activities not brought them into the field of medical research and so focused upon them a specially intense effort. Even with higher parasites, e.g., the worms, science would have been poorer without the results of the patient and difficult studies which have revealed to what degree of complexity parasitism may proceed. The development of filaria in the mosquito, of dracunculus in the water-flea, of schistosoma in the snail are examples. In entomology certain groups, like the mosquitoes, have almost been a preserve in the hands of medical workers or those who work at them knowing the great medical interest taken in this group.

The modern investigation of drugs and especially the search for effective therapeutic compounds of mercury, arsenic and antimony has added considerably to the stimulation of chemists in these subjects. Even more has the close association of the processes of health and disease with colloidal chemistry brought medical research activities into the higher realms of chemical research. A vast literature on immunology, really a study of complicated protein reactions, comes strictly perhaps almost under physical chemistry, though the techniques and chief results have been carried out in connection with the study of disease.

Nor is physics immune from the encroachments of the nameless science we are discussing. Questions of the electric charge borne by colloidal particles, adsorption and surface tension phenomena, and much else has been increasingly familiar in medical research laboratories in recent years.

#### *Some Special Developments.*

But the contributions to science of medical research, though they must naturally in a sense fall within the limits of physics, chemistry or biology, are not always merely applications of these sciences or subordinate additions to their findings. With a mention of some recent examples of such a kind, space now demands that I should bring my remarks to a close.

First I will take the very interesting subject of bacteriophage and the biological issues raised by this. From about 1917 a series of communications by d'Herelle clearly set forth the discovery of an entirely new phenomenon, in which the essential feature was the apparent eating up, or more strictly the solution, of the bodies of various kinds of bacteria under the influence of an invisible "enemy." d'Herelle was working at the bacteriology of the contents of the alimentary canal of locusts, seeking in fact for a virulent organism capable of being used in the destruction of these insects. When making plates in the usual way for the isolation of organisms it frequently happened that clear spaces were evident in the opaque growth of the bacteria under investigation.

These spots it was eventually clear were the results of the activity of some invisible agency which dissolved the bodies of the bacteria. Under the microscope when the process was in action one could see a vacuole appear in the substance of a bacterium which increased in size, and if others were present coalesced with these, until suddenly the minute bacterial body underwent complete dissolution. Transferring material from a clear spot to an unaffected area on the plate caused the phenomenon to repeat itself.

Not only was the principle causing this solution of bacterial substance invisible, but it was found to be capable of passing readily through the pores of a Pasteur Chamberland filter, a fact that showed that it was far more minute than the organisms with which it was associated. Further this principle was capable of indefinite self-propagation. If to a tube of culture a little of this principle was added, the bacteria which cause the nutrient fluid medium to be turbid were dissolved with the result that the medium then became quite clear. If a tiny drop, or fraction of a drop, from such a cleared tube were added to a fresh culture this also was cleared and such a process could be repeated for as many transplantations as one wished, the enormous dilution involved after a time making it quite clear that the principle, whatever it was, was reproducing itself actively in every tube. Evidently the principle had one very important character which we are accustomed to think of as proper to life, viz., it was capable of indefinite self-propagation so long as there was "food" for it to work upon.

Though invisible it was possible to show that this principle was particulate and indeed it is now quite well known that it is of the nature of a protein colloidal particle. The phenomenon is called by d'Herelle bacteriophagy and the particulate cause "bacteriophage."

Now is this principle alive? Hitherto biologists have dealt with life as tantamount to properties exhibited by the "cell." Always it is protoplasm, usually with a nucleus, which is supposed to be alive. In the bacteriophage we have something clearly very near a living thing which is clearly not a cell, nor is it protoplasm. I am not here to-night to say whether the bacteriophage particle represents life or not, but you will agree with me that here medical research has brought into the workshop of science something that can be easily investigated and which must be of supreme interest to the biologist.

d'Herelle believes that natural cure in disease results when the bacteriophage in Nature overcomes the infecting organisms. All the immunological process medical research has dealt with in such vast but confusing thoroughness he admits only as accessory phenomena, mere necessities of colloidal phases. What the practical importance of bacteriophage may be none can yet say. Even if it should have no direct bearing on the prevention of disease, which is unlikely, it is a new line of investigation into most fundamental regions of colloidal chemistry and biology, and who can say at this early stage where it may lead?

But the bacteriophage does not stand alone. It has close relationships with the so-called filterable viruses. When the microbial origin of many diseases had been demonstrated it was natural to believe that all infectious diseases must be due to some form of organisms even if one had failed to demonstrate this. And a certain number of diseases have eventually fallen under the microbial category though they for a time resisted the search for a causative microbe. But many have resisted every attempt and some of these are amongst the most deadly of diseases known, e.g., smallpox, rabies or hydrophobia and yellow fever. In many such cases it is now recognized that infection will pass through the Pasteur Chamberland filter and so it is probable that the causative organism, if it is an organism, has not been seen because it is too small for visibility. Further, infection is not thought to be the result of an organism in the



accepted sense, i.e., minute cells as the bacteria and protozoa all are, but to be probably of the nature of protein colloidal particles and for this reason they are known as "viruses." Indeed the bacteriophage seems to be only a special form of an entirely new type of living thing, i.e., if we are prepared to define life as ordinarily understood, and certainly smallpox, for example, if it is not due to a living thing is remarkably similar in its natural history to other diseases that are.

Yet if these viruses are living things they are something almost if not quite as far below the bacteria in size as these are below living things visible to the naked eye. And on account of their size they are subject to influences which do not affect the relatively large bacteria or protozoa. Bacteriophage, for example, when first added to a bacterial culture disappears entirely from the fluid medium, to appear only later when the bacteria are breaking down. In other words it appears to be subject to adsorption, which not even the smallest bacterium is.

There still remain diseases as outstanding puzzles as ever any disease has been, I need mention only cancer, and medical research, nameless as a science though it is, may yet strike many things in its own proper sphere which are of great importance in the general advance of science.

## Medical News.

### THE NORMAN GAMBLE FUND AND RESEARCH PRIZE.

THE Council of the Royal Society of Medicine has accepted, as a trust, the sum of one thousand pounds (£1,000) presented by Mr. Norman Gamble for the purpose of founding "The Norman Gamble Fund and Research Prize."

The Norman Gamble Research Prize of value £50 shall be awarded for the best original work in Otolaryngology completed during the four years previous to the month of October in the year of the award. The competition for this prize shall be open to any British subject, whether lay or medical, who cares to compete, whether or not such persons be holders of or candidates for grants in aid of research.

Grants in aid of research work in Otolaryngology may be made to any British subject, lay or medical, who may be recommended by the Committee of Award to receive such grants, whether or not such person be a holder of or a candidate for the Norman Gamble Prize. Moreover, such grants may be given either to persons who apply for a grant in order to carry out a specific piece of work, or to selected workers chosen by the Committee of Award to carry out certain specified work of its selection.

Any person to whom a grant in aid of research is made from this Fund shall, within such time as may be allowed by the Committee of Award, render a typewritten or printed report in the English language on the work which has been carried out under the grant, and the Committee of Award shall have the right to publish such Reports.

The Committee shall not make any recommendation either for the award of the Norman Gamble Prize or for any grant in research if the papers or work under consideration are not of a sufficiently high standard.

The Committee of Award will consider applications for the Prize and for grants in aid of research work in October 1930.

Applications for the prize and for grants in aid must be received by the Secretary of the Royal Society of Medicine, 1, Wimpole Street, London, W.1, not later than 30th September, 1930, and must be in accordance with the regulations stated above.

### THE SUMMER 1930 SHORT POST-GRADUATE COURSE IN NEUROLOGY AND PSYCHIATRY IN VIENNA.

THE fifth intensive course in the above subjects is announced to commence on 23rd June, 1930.

The course will last six weeks terminating on 31st July, and will be conducted in English. It will be held for a minimum number of eight and a maximum of fifteen men. The fee is \$150, about £30 15s., including the subscription to the American Medical Association in Vienna [Alserstrasse (9) Vienna (VIII)], under whose auspices the course has been organized.

Applications with a banker's draft for \$40, about £8 4s., should be directed to:

Docent Dr. E. Spiegel, Vienna, I. Falkenstrasse 3, Austria. They will be accepted in the order in which they are received. Deposits will be refunded if the number of applications is insufficient for the course to be held. A card is issued which permits holders to enter Austria without paying the Austrian visa.

The more important of the clinical lectures will be held during the first three weeks of the course in which also the major part of the psychiatric section will be taken.

Further particulars as to the course may be obtained from Docent Dr. E. Spiegel, at the address given above.

It is understood that modest hotel charges in Vienna are about twelve shillings a day and that pension rates are much less. The American Medical Association in Vienna will supply this information.

### BOMBAY MEDICAL COUNCIL.

THE following summary of the proceedings of the meeting of the Bombay Medical Council held on the 10th February, 1930, is published in the Press for information:—

Major General W. H. C. Forster, I.M.S., the new President, was introduced to the Council by Sir Temulji Nariman.

The Council considered a suggestion of Mr. V. K. Chitnis, M.B., B.S., that the Diploma in Ophthalmology which the Bombay University now grants be recognized for registration as an additional qualification, and resolved to accept the suggestion.

The Council considered an application for registration from Mr. J. H. Godbole, a Sub-Assistant Surgeon, who was refused registration in 1921 in consequence of his having been convicted in 1915 under the Military Law by a Court-Martial of the offence of committing an assault on his superior officer at Brighton, and resolved to admit Mr. Godbole to registration.

The Council considered a letter dated the 17th August, 1929, from the President of the All-India Medical Licentiate's Association communicating for favourable consideration a resolution No. 15 passed by that body on the 21st March, 1929, to the effect that due representation be given to medical licentiatees on the Provincial Medical Councils according to their number on the Medical Register, and resolved that it was not advisable to give more representation to the medical licentiatees on the Council as at present constituted, on the strength of their number only.

The Council considered an application from Mr. Ratilal Shrivastav, M.B., B.S., of Rajkot, for the restoration of his name to the Medical Register whence it was removed in September 1928 under section 9 of the Bombay Medical Act, 1912, for infamous conduct in a professional respect, and resolved that the name of Mr. Shah should not be restored to the Register at present.

The following six members of the Council were elected by ballot as members of the Executive Committee:—Khan Bahadur Sir Nasarvanji Choksy, K.L., C.R.E., Dr. Y. G. Nadgir, Sir Temulji B. Nairman, K.L., Dr. Dinshah M. Gacrat, Dr. Rajabally V. Patel, and Lieut.-Colonel R. Row, O.B.E.



## EIGHTH CONGRESS, F.E.A.T.M.

We have been asked to inform our readers that the Eighth Congress of the Far Eastern Association of Tropical Medicine will be held from the 7th to the 13th December, 1930, at Bangkok. The programme for the first week is given below. The membership fee is £3, for which members not only have the right of attending the Congress, but also receive the official *Transactions* (which, for the Seventh Congress in 1927 at Calcutta ran into three very large and profusely illustrated volumes). Following the Congress, the week 14th to 21st December will be devoted to tours in Siam.

Those desirous of attending the Congress should communicate with the Local Secretary for the Congress in their Province. The Local Secretary for Bengal is Lieut.-Colonel A. D. Stewart, I.M.S., Calcutta School of Tropical Medicine and Hygiene. It is essential that early notice should also be given of papers which it is proposed to read or present at the Congress. General enquiries should be addressed to:—

The Far Eastern Association of Tropical Medicine, c/o Hoofdkantoor van den Dienst der Volksgezondheid, 10, Paranattan, Weltevreden, Java.

The following is the detailed programme for the Congress.

*Sunday 7th to Saturday 13th December, 1930.*

Ten a.m. to 4 p.m. The Information Bureau will be open for registration of members, distribution of badges and literature, and selection of excursions, visits, etc., from 14th December, 1930.

## LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE.

(Division of Tropical Medicine and Hygiene.)  
Examination Result. 87th Term. October, 1929—February, 1930.

*Passed with Distinction:*

Davidson, W. C., Winner Sorley, J. T.  
of "Duncan" Medal. Strahan, J. H.  
Hackett, C. J. Stratman-Thomas, W. K.  
MacLennan, N. M.

*Passed:*

Adam, F.	Kneedler, W. H.
Adgie, C. R.	Kocher, S. L.
Affleck, R. C.	Krishna, B.
Black, J. J.	Little, W. R.
Burgess, R. C.	Lowther, N. N.
Cust, A. D.	Mackay, A. F.
Czarkowska, J.	Malone, E. K.
Dowdeswell, R. M.	Mirza, W. A.
Egan, E.	Miterstein, Z.
Farmer, A. P.	Powell, G. M. C.
Fratel, A. M.	Scott, W.
Gharpure, P. V.	Swift, S. H.
Gilbert, F. W.	Thyne, W. H.
Gowenlock, D. E.	Tilsley, G. E.
Grey, A. B.	Trim, E. A.
Harris, D. B. L.	Vine, L. E.
Holm, C. C.	Washburn, B. E.
Hutchinson, W. J.	Wig, K. L.
Johnson, P. D.	Williams, C. T.
Kinneard, G.	Williams, F.

Date.	Forenoon.	Afternoon.	Evening.
Sunday, 7th December.	10 a.m. Meeting of the Council.		
Monday, 8th December	11 a.m. Opening of Congress by H. R. H. Prince Paribatra of Nagor Svarga—the Minister of Interior—in the Chulalongkorn University Hall.	4-6 p.m. Sight-seeing.	8 p.m. Dinner given by H. R. H. Prince Paribatra of Nagor Svarga to official delegates, 9-30 p.m. Reception followed by performance of Lakon (Siamese classical dancing). (Evening dress with decorations.)
Tuesday, 9th December.	10 a.m. to 1 p.m. Meeting of Scientific Sections (in the University lecture-rooms).	4-5 p.m. Visit to Health Centres. 5-6 p.m. Garden Party by H. H. the Minister for Foreign Affairs.	
Wednesday, 10th December	10 a.m. to 1 p.m. Meeting of Scientific Sections (in the University lecture-rooms).	4-6 p.m. Visit to Sowabha Institute and Chulalongkorn Hospital.	9 p.m. Reception by H. H. the Minister of Public Instruction. (Evening dress with decorations.)
Thursday, 11th December.	10 a.m. to 1 p.m. Meeting of Scientific Sections (in the University lecture-rooms).	4-6 p.m. Visit to Siriraj Hospital.	9 p.m. Royal Command performance of Symphony Concert.
Friday, 12th December.	10 a.m. to 1 p.m. Meeting of Scientific Sections (in the University lecture-rooms).	1 p.m. Luncheon by the Medical Association of Siam. 4-6 p.m. Sightseeing.	9 p.m. Royal Command performance of "Khon" (Classical mask dancing.)
Saturday, 13th December.	11 to 12 a.m. General Business Meeting of the Association. Closing of Congress in the Chulalongkorn University Hall.		8 p.m. Congress Dinner. (Evening dress with decorations.)

## THE INDIAN SCIENCE CONGRESS, 1931.

THE Indian Science Congress, 1931, is to be held at Nagpur in the first week of January, 1931. The President of the Medical and Veterinary Research Section is Dr. U. N. Brahmachari, M.A., M.D., Ph.D., F.A.S.B.

In view of the fact that an excessive number of papers have been received in past years, which has made it impossible for all the papers to be read in the time available, and necessitated the curtailment of discussion on other papers, it has unfortunately been found necessary to exercise a strict selection. Authors are requested to take note of the following points:

(i) Papers on Medical and Veterinary Research must be received by the Sectional President, Dr. U. N. Brahmachari, C/o The Asiatic Society of Bengal, Calcutta, not later than the 15th October, 1930, which is the last date for accepting papers according to the rules.

(ii) Only original papers, that is to say, papers which have not already been read or published in the same or similar form, will be accepted. Not more than two papers will be accepted from any one contributor.

(iii) Papers will not be accepted from individuals who have not paid their subscription. The General Secretary has asked us to particularly bring this matter to the notice of our readers.

(iv) Papers must be sufficiently short to be read in 20 minutes. It takes 3 minutes to read a page of foolscap intelligibly, apart from diagrams, slides, etc. Papers should not, therefore, exceed 7 pages of typed foolscap.

(v) Papers must be accompanied by 3 typed copies of an abstract of the paper. This abstract must not exceed 200 words, and should not contain any formulae or diagrams. *Papers not accompanied by such abstracts will not be accepted.* It is not fair on members of the Congress not to have due notice from the programme of what the paper is about.

(vi) All diagrams, tables, pictures, etc., should be reduced to lantern slides, or enlarged to posters corresponding in type to 6 1/8 Snellen.

(vii) Authors should not contribute accounts of their papers to the local lay press. It is hoped that it will be possible to arrange for a daily precis of the proceedings in the Medical and Veterinary Section to be sent to the press officially by the President of the Section.

(viii) Workers in Bengal and neighbouring provinces are requested to send their papers before the 21st September, 1930, when the Puja Holidays begin this year. The attention of authors is drawn to the resolution of the Executive Committee that abstracts of papers submitted after the last date (15th October, 1930), shall on no account be printed in the advance copy of abstracts.

Will our readers kindly take this notification as the first official intimation with regard to the 1931 Congress? We trust, further, that the members of the medical veterinary professions in Nagpur will co-operate to make the 1931 Congress a successful one.

There are three classes of members of the Indian Science Congress; viz.:—

(i) Full members; annual subscription, Rs. 10.

(ii) Associate members; annual subscription, Rs. 5.

(iii) Student members (who must be certified by the principal of their college to be such). Rs. 2.

Only full members have the right to read papers. Associate and student members may submit papers through a full member. Subscriptions should be paid to the Honorary Treasurer, Indian Science Congress, c/o the Asiatic Society of Bengal, 1, Park Street, Calcutta. Forms of application for membership can be obtained from the General Secretary, the Asiatic Society of Bengal, No. 1, Park Street, Calcutta.

## Current Topics.

## Cancer in Hawaii.\*

IN an interesting address delivered by Dr. Fredrick L. Hoffman, LL.D., before the Pan-Pacific Surgical Congress at Honolulu on August the 17th, 1929, a study is presented of the contrast between cancer in the native Hawaiians and the same disease as seen among the white population of the American Pacific coast. The author's summary is as follows:—

(1) As far as it is possible to judge, cancer in Hawaii during the last five years has shown no pronounced tendency towards an increase.

(2) The cancer death rate in Hawaii is measurably below the average for most other civilized countries or localities.

(3) Cancer death rates according to racial composition show pronounced differences of outstanding importance, the most suggestive of which is the excessive mortality from cancer among native Hawaiians, which is in marked contrast to the general rarity of the disease in primitive populations.

(4) The most important form of cancer in Hawaii, as elsewhere, is cancer of the stomach and liver. No other form of cancer seems to prevail to a degree demanding specialized attention.

(5) Cancer of the female genital organs and the breast appears not to be excessively common among any of the various racial elements, but this matter demands further investigation.

(6) The most suggestive aspect of the problem, considered with reference to specific organs and parts, is the non-occurrence of cancer of the breast among Japanese women, which is in strict conformity to the rarity of this form of the disease in Japan. It would therefore be extremely valuable to make this matter a subject of a special study, particularly on the part of practising Japanese physicians in the Islands, who would have the best facilities for the purpose.

(7) Cancer of the lungs, which is still relatively very rare, is shown to have occurred in Hawaii, but to a much lesser extent than on the mainland.

(8) Cancer of the buccal cavity is relatively uncommon in the Hawaiian Islands, except cancer of the tongue, from which there have been ten deaths among the population during the five years under review.

(9) Cancer of the oesophagus is fairly common among the male population, there having been 27 deaths out of a total of 602. Cancer of the male genital organs is relatively rare. Cancer of the pancreas is relatively common, there having been 19 deaths, and 13 deaths from cancer of the prostate, out of total of 602.

(10) As shown by the table at the outset, cancer is not at present on the increase in the Hawaiian Islands, there having been 127 male deaths during the first of the five-year period against 128 deaths during the last.

(11) Among the women in the Hawaiian Islands the outstanding form of cancer is of the uterus, there having been 128 deaths from this form of the disease out of a total of 364. The disease is not, however, rapidly increasing, there having been 27 deaths during the first year of the period against 22 deaths during the last year and 33 during the mid-year 1925-1926.

(12) Cancer of the breast caused only 22 deaths out of a total of 364 deaths, or 0.06 per cent. There were two deaths from cancer of the breast during the first year, seven during the second, four during the third, four during the fourth, and five during the fifth. There is therefore no definite trend towards an increase. Most other forms of cancer among women are very rare.

\* Published by the Prudential Insurance Co. of America, Newark, New Jersey, U. S. A.

(13) The cancer problem as regards the female population in Hawaii chiefly concerns the stomach and liver and the gastro-intestinal tract, as well as the uterus.

(14) Cancer deaths with a previous operation constitute about one-fourth of the total, which is less than one-half the proportion common on the mainland. This would be suggestive of much needless neglect or delay to which attention may be directed.

(15) The number of deaths coming to autopsy was only 137 out of a total of 966. It would be highly desirable if this proportion were much larger, to make sure of the terminal diagnosis.

(16) The number of deaths in hospitals is about 40 per cent. of the total, which is also about two-thirds of the proportion normal to the mainland. It is therefore indicated that there is need of more general hospital provision for the natives of the different islands, but I am not sufficiently familiar with the medical and hospital facilities to enable me to judge of the facts of the present situation.

(17) The average age at death from cancer in Hawaii is several years lower than for the mainland. For males the average age is shown to have been 57.7 years and for females 53.8 years. These averages, of course, are affected by the peculiar age constitution of the Hawaiian population, including as it does a large proportion of comparatively recent immigrants, mostly from Asiatic countries.

(18) As far as it is possible to judge, the registration of vital statistics in Hawaii is practically complete.

### Treatment of Varicose Veins and Varicose Ulcers by Injection.

By REGINALD T. PAYNE, M.B. (Lond.).

(Abstracted from *The Lancet*, 17th August, 1929, Vol. CCXVII, p. 313.)

#### Technique of Injections.

THE quinine and urethane preparation is of the following formula:—

Quinine hydrochloride	..	4.0 g.
Urethane	..	2.0 g.
Aq. dist.	..	ad 30 c.cm.

The active principle causing damage to the endothelial lining of the vein is the quinine, the urethane merely raising its solubility in aqueous solution. On standing, the solution slowly deposits crystals of quinine hydrochloride; these can easily be redissolved by warming to body temperature.

The actual technique is similar for the two solutions. The patient stands in a good light and an Esmarch tourniquet or Martin's bandage is applied proximal to the proposed site of injection. The object of this is to render the veins prominent during the insertion of the needle, and in all cases it should be removed before the injection is made. The patient then lies down and the region of the proposed injection is carefully cleaned with ether. A 5-c.cm. Record syringe carrying a No. 17 needle is filled with the required amount of solution and introduced obliquely through healthy skin into the lumen of the vein. The plunger is then slightly withdrawn to confirm the fact that the needle is in the lumen. At this point the tourniquet is removed, allowing the vein to collapse and ensuring that the quinine and urethane solution reaches the vein walls in a high concentration. As a rule, 1 c.cm. in 15 seconds is about the average rate of injection, but no force must be used and the time must depend to some extent on the resistance encountered. Pressure is then applied with an ether swab over the site of injection and the needle is withdrawn, the swab being kept in position for two minutes. The puncture is dressed with collodion on a pledget of wool, and when dry the whole is covered with a small square of wool and firmly bandaged. The maintenance of digital pressure after injection, the collodion dressing, and the bandaging are designed to lessen the risk of leakage of blood mixed with injection

material into the subcutaneous tissues around the site of puncture. Leakage is almost certain to cause local complications. The patient goes home, and returns at the end of a week for further treatment. All the patient's usual activities are permitted, rest is not enjoined, but the normal reactions which follow injection are explained.

Considerable discussion has centred round the question of the position during the injection, many workers preferring to have the patient standing. This was done in some of the earlier cases but abandoned because many of the patients objected. On theoretical grounds, it might seem desirable to insist on rest for 10 to 15 minutes after the injection to prevent any possible aspiration of blood into the deeper veins, but this has not been carried out and no untoward effect has been noted.

#### Dosage.

It is advisable to commence with a small dose of quinine urethane solution and for the first injection 0.5 c.cm. is invariably employed. This has a twofold object, the first being to test the local reaction of the veins to the solution, and the second to discover whether or not the patient possesses any special idiosyncrasy towards quinine. Subsequent injections are, in practically all cases, 2 c.cm. per dose, which can generally be relied on to thrombose 5 to 6 inches of a vein. Larger doses may be necessary in a few cases, but more than 4 c.cm. should never be given at one sitting. It is important to follow cases closely to see exactly what degree of thrombosis injections are producing, for individual differences play a large part and injections must be regulated accordingly.

The technical details for sodium salicylate solutions are the same as for quinine, except in dosage. Three strengths, 20 per cent., 30 per cent., and 40 per cent. are used. Injections should begin with 2 c.cm. of 20 per cent. solutions, which will usually thrombose about 4 inches of vein. Later injections must be regulated according to the amount of thrombosis produced. If the 20 per cent. solution is adequate, injections may be confined to this; if inadequate the 30 per cent. or 40 per cent. solutions must be tried in doses up to 4 c.cm. until the requisite effect is obtained. It is important to bear in mind the fact that veins appear to establish a remarkable tolerance towards salicylate solutions, as a consequence of which they fail to thrombose. For this reason the surgeon should work as rapidly as possible up to a dose and strength which produces the required effect.

Whichever solution is used, I do not think it is desirable to attempt to produce more than about 5 inches of thrombosis each time; if more is done the method is likely to cease to be strictly ambulatory, owing to the discomfort produced.

#### Site.

In general, treatment should be commenced in the most distal part of the limb, and each succeeding injection given proximal to its predecessor. This enables the operator to distinguish at once thrombosed from non-thrombosed veins. An exception to this rule is made when the varicose condition involves the region of the ankle-joint. Veins in this position should always be left till all others have been treated; they are then usually found to be entirely symptomless and very much smaller in size. If, however, it is decided to inject this region, it is as well to bear in mind that boots and shoes are likely to cause considerable discomfort during the thrombosis.

Using the doses described above, injections will be necessary at intervals of approximately 4 to 5 inches along the course of varicose veins, and in this way the whole saphenous tract may be treated to within about 4 inches of the saphenous opening.

In the earlier cases, while the total amounts injected were the same as those now used, the dose was given at two or three sites spread over about 5 inches of vein. This has now been given up entirely in favour of the injection of the whole dose at one

site. The results have been just as satisfactory and much less discomfort is caused.

#### *Reactions.*

1. *Quinine.*—Injections should be entirely painless, apart from the prick of the needle as it penetrates the skin; pain during the injection shows that the fluid is finding its way into the subcutaneous tissues and is an indication for discontinuing the injection at once. Thrombosis begins between 12 and 24 hours after the injection and is accompanied by slight swelling, aching, and tenderness of the vein. This pain is invariably accentuated by postural changes, and is especially noticeable in the morning. As a rule the thrombosed segment becomes partially adherent to the overlying skin as a result of mild periphlebitis but, although this occasionally shows a linear bruising, redness is unusual. After about four days the vein begins to shrink, and this process continues for at least three months. Local tenderness disappears at the end of a fortnight, but bruising may take six weeks to clear up, and at times a slight permanent pigmentation is left. All these reactions are more severe where the vein is situated over bony prominences which prevent its sinking back into the subcutaneous fat. Patients show marked individual variations in the degree of reaction. The subsequent discomfort is in most cases slight and rarely limits activity. In the present series four cases lost two days' work each, and one case one day, in consequence of more than usual discomfort.

Constitutional effects due to quinine were observed in 4 per cent. of the cases and included nausea and vomiting, tinnitus, headache, and a transient intermenstrual loss. In women quinine injections must not be given during menstruation. No general quinine reactions were seen in the male cases.

Abnormal local reactions, due to leakage of blood mixed with the quinine solution into the subcutaneous tissues, are also occasionally seen. In their mildest form these consist of blood blisters, half an inch in diameter, which dry up in about three weeks. If the local process is more severe necrosis occurs, leaving a small eschar which heals in four to six weeks. These eschars were produced in eight cases in the first 500 injections, and in three cases in the last 1,000 injections. The high incidence in the former group was due to the fact that in these the punctures were dressed with collodion only, whereas in the latter group the special precautions described were adopted. It is highly important, I think, that this type of complication should be guarded against by all possible means, for it provides an entry for sepsis with all its attendant dangers. In the present series, however, no septic complication has been seen. This necrosis sometimes occurs at sites remote from the injection, through a vein which is very thin-walled at that point. In such cases the dosage has been too high. Three cases showed rather more extensive thrombosis than was intended, in that this reached from the region of the knee to the mid-thigh, a distance of 8 inches. These all occurred in veins which possessed no obvious tributaries and in which, therefore, the effects of stagnation were likely to be marked.

2. *Salicylate.*—The use of sodium salicylate solutions has in the present series been confined to cases which showed an idiosyncrasy towards quinine or in those associated with pregnancy. Salicylate invariably gives rise to considerable cramp-like pain during the actual injection, but the subsequent discomfort is usually less than with the quinine method. No local lesions have been observed, but the two solutions seem equally likely to produce these. Varicose veins rapidly develop a tolerance to sodium salicylate, and for this reason the doses and strength of the drug has to be increased as treatment proceeds. Occasionally this results in failure to achieve thrombosis even with large doses of the 40 per cent. solution. Quinine injections have never failed.

#### *Results in Uncomplicated Cases.*

I will not attempt to present the results in statistical fashion, as this is extremely difficult. Only too often varicose veins are but a part of the clinical picture, which is obscured in no small degree by other associated conditions, of which the commonest are flat feet, hallux valgus, and the various forms of arthritis. On the whole, therefore, clinical impressions appear to be more reliable. Since injection treatment gives 100 per cent. cure in cases not associated with other pathological conditions, it can, I think, be justly inferred that, in so far as the veins are concerned, similar results are obtained in cases where the picture is complicated by the presence of other diseases.

Even from a comparatively early stage of treatment patients begin to experience relief. Bandages and elastic stockings are abandoned, usually before injections are completed, although the final functional and cosmetic results are not seen until at least three months after all treatment has ceased. From the functional standpoint, patients in whom moderate activity was only possible with limbs swathed in mummy fashion can now work and play in comfort. From the cosmetic standpoint, limbs which once resembled Saxon gouty ballusters are restored to more conventional outlines. From both these standpoints, treatment appears to be equally successful in all the various types of veins. The small and early varix of the calf, the dilated and tortuous entire saphenous vein, and the advanced, diffuse, arborescent veins of the lower leg, all respond well. Injection methods are also applicable to the spidery varicules so often seen in women; these are often almost symptomless and in the present series they have only been treated when complicated by recurrent subcutaneous ruptures. Whichever type of case is considered, one of the most striking features of treatment is the remarkable recovery of tone and elasticity of the thinned and atrophic skin after obliteration of the veins.

All cases should be kept under observation for at least a year after treatment has finished. In the present series no case has shown re-canalization of a thrombosed vein when the varicosity was confined to a single main vessel where this could easily be recognized. In the type of case where the entire calf is an entangled mass of interlacing veins, prolonged observation is, however, especially necessary, for reactionary changes in the thrombosed veins often hide smaller veins which are still patent. Injection treatment offers no guarantee against the development of varicosities in other veins, but it does provide a simple means of dealing with these at an early stage should they arise.

#### *Results in Ulcer Cases.*

If trauma or infection should be superimposed upon an inefficient skin circulation, a particularly chronic type of ulceration is bound to ensue. In general, persistence of ulceration on the surface of the body is due either to chronic infection or to circulatory conditions so inadequate that repair processes cannot be carried on. The results of injection treatment show that the vascular instability is undoubtedly often responsible for the chronicity of the lesions, and that infection plays a secondary rôle. Varicose ulceration has in the past been cured by rest in bed, by the various forms of Unna's bandaging, and by surgical treatment of the veins; it is now curable by injection methods. The common factor underlying all these measures is the relief of venous congestion, temporarily, by rest and bandaging and permanently by operation or injection.

Before commencing injections it is best, in cases where the skin around the ulcer is in a very unhealthy state, to carry out this treatment for two or three weeks. Injections should never be made through the unhealthy skin which so often surrounds the ulcers. Coming into contact with the ulcer above will be found, in almost all cases, a large radicle of the internal saphenous vein. This vessel has been referred to

adequately, in relation to the organs and tissues innervated through it and in relation to the cerebro-spinal nervous system, to point out its developmental and general physiological relationships to the cerebro-spinal nervous system, and to set forth the more important pathological and clinical data bearing on the functional relationships of this division of the nervous system in disease."

The subject-matter is dealt with in a lucid and scholarly manner in twenty well-arranged chapters. Copious illustrations add to the great utility of the book. An exhaustive bibliography is appended at the end of the volume. We have great pleasure in welcoming this up-to-date treatise and commending it to those interested directly or otherwise in the nervous system.

S. S. R.

#### RECENT ADVANCES IN PREVENTIVE MEDICINE.—

By J. F. C. Haslam, M.C., M.D. (Edn.), M.R.C.P. (Edn.), D.P.H. with a chapter on the Vitamines. By S. J. Cowel, M.A., M.B., M.R.C.P. London: J. & A. Churchill, 1930. Pp. VIII plus 328 with 30 illustrations. Price, 12s. 6d. net.

It is interesting to note the change that has come over the meaning of the words "preventive medicine." The old narrow conception which limited the outlook of sanitarians to drains and damp proof courses has been replaced by a wider and truer outlook which really embraces not only its particular branches but also the whole of so-called curative medicine, certain aspects of sociology, economics and political legislation. It would be a large task to deal with every aspect of preventive medicine in these wide ranges that has made advances within recent years and Dr. Haslam has had perforce to limit the subjects dealt with, and he has confined his attention to particular lines of advances which illustrate the newer type of preventive medicine as contrasted with the older limitations of purely environmental sanitation. Every writer in preventive medicine will be grateful to Dr. Haslam for his excellent summaries, and we only wish he had been given opportunities to deal with certain other matters which have had to be omitted for want of space. Advances in preventive methods in tropical diseases such as malaria, hookworm, kala-azar and cholera have had to be omitted. We would have welcomed a separate chapter on the modern studies of epidemiology, especially the work of Topley, Webster, Dudley, Gill and others, though these are used to illustrate points in various chapters.

The subjects deal with are:—

Eugenics, Maternal Mortality, Wastage of young life, Childhood, Milk, Vitamins, Atmospheric conditions, Hygiene in Industry, and Active Immunisation.

In the first, the outlines of a modern practical eugenic policy are given and the possibilities and the results already achieved discussed. Some States have applied some of them legally mainly in the segregation of criminals, the sterilization of the unfit and feeble-minded and the production of "fit" certificates before marriage. Public opinion is not yet sufficiently formed to accept logical results, but in California where sterilization of 6,255 individuals has been carried out up to 1st January, 1929, the result has been recorded and opinion seems to be now that

(1) As a penal measure sterilization is not justifiable.

(2) It is not the function of the State to apply it therapeutically.

(3) Compulsory eugenic sterilization is reasonably workable under proper safeguards (especially on people who have become a charge on the State).

In the chapters on maternal mortality and the wastage of young life, especially the first month of life, the interdependence of these two mortalities is emphasised. Neither mortality has shared in the general fall in the death rates and close investigations have been made as to the reasons. It is a curious fact that countries in which there have been the greatest declines in infantile mortality in the first year of life still show high maternal and

neonatal mortalities. The studies of Kinloch and others are the best recent investigation of the facts. Toxic conditions including puerperal sepsis would seem to be the most potent cause of maternal death. The *Streptococcus hemolyticus* is the offending agent in the majority of cases and Kinloch's report points out how puerperal sepsis exhibits the phenomena of an ordinary droplet infection epidemic, and that throat carriers of the streptococcus spread the condition by spray infection of sterilized hands and instruments. Trauma also plays a part in increasing liability to infection, but in Kinloch's view does not fill the part to the extent which some obstetricians including Young, would assign to it. For remedy and prevention an ideal maternity service has been advocated, comprising antenatal clinics, an expert midwives service for normal cases (for sepsis is commoner in doctors' practice than in midwives), a specialist service (not just the general practitioner), maternity hospitals for abnormal cases, isolation hospitals for pyrexias and maternity homes for normal cases.

The wastage of life in the first month are due mostly to complications of labour; syphilis accounts for only 10 per cent. of neonatal deaths; investigation would go to show that the health of the mother during pregnancy and especially in the first month after labour is the determining factor for good or ill. Fœtal injuries both in forceps cases and in uncomplicated cases (especially perineal tears) are a feature of statistical enquiry, and lobar pneumonia in the first few days of life is an unexpectedly large cause. The cause is obscure and it is often a colon bacillus infection.

The care of the pre-school child has received a great deal of attention. Striking photographs are given of school classes in 1894 and 1924, the differences in the facies, the expression, and the dress are extraordinary. One can pick out 10 month breathers in the 1894 class for every 1 in the 1924. Nursery schools have done a great deal to improve conditions and to remedy and prevent conditions which are all too frequently found when the first inspection by the school medical service is carried out. The question of adequate and suitable nutrition of the school child has received much attention. The defects are qualitative rather than quantitative, and supplementary meals of milk and cod-liver oil are now a common feature of school life. This is taken advantage of by large number of non-necessitous families on payment. The cause of dental caries has advanced in knowledge by the work of M. Mellanby on vitamin D. Whether defective structure or carbohydrate fermentation is the main factor in dental caries is still under consideration but M. Mellanby's work seems to have gained many adherents.

In the chapter on milk, there is a note on the average amount of milk consumed in various countries: 1 pint per head per diem is considered a desirable minimum, but most countries fall far short of this. Switzerland heads the list with 1.33 pints; Italy only 0.07 and the United Kingdom varies from 0.1 to 0.31. For chemical analysts, there is a useful review of several papers by Tocher. Chemical standards of purity must always be approximate and have a "herd" value. Individual cow's milk varies widely. Water is the least variable and fat and protein the most variable. Tocher points out that as the water content of the original milk is never known, so the percentage of added water can never really be stated with accuracy, being determined on the hypothetical value of solids-not-fat. All public analysts in India should read the original papers of Tocher.

Irradiated milk has been used to treat rickets and benefits certain anæmias in children to a very large extent. Certain epidemics of sore throat have been shown to be milk-borne; the cause is a hæmolytic streptococcus which has infected the udder through an infected human being. The same mechanism would appear to be true in scarlet fever. An interesting epidemic of arthritis due to milk is noticed. A useful

discussion of the problem of improving the milk-supply is given and the pros and cons of the two views discussed, e.g., whether to aim at milk free *ab initio* from pathogenic germs and of high nutritive value or at one which despite sundry defects will be safe; the first is expensive and difficult though ideal, the second is probably dangerous but has practicability at present. The present system of "grading" is defective in that there is no standard of bacteriological purity for ordinary milk, while the grading is misunderstood by the public. Grade A (third in order) is by its name taken to be the highest grade. The American views on pasteurisation seem sound, i.e., when a milk supply cannot be adequately inspected and controlled by the sanitary authority (as in rural areas), it is better to insist legally on pasteurisation. The interesting experiments on the great advantage of giving children milk carried out by Corrie Mann and in Scotland are described; the growth qualities are not dependent on the cream, for skimmed milk is equally efficacious. A good comparative description is given of the attempts to eradicate bovine tuberculosis and to lessen its dangers—the Bang, Ostersteg, the English and the American systems being contrasted. The B. C. G. system of immunizing children by living attenuated tubercle bacilli is considered as non-proven; with a leaning towards dubiety.

An interesting history of the vitamins is given—this work has received wide publicity, however, and most will be already familiar with it.

One of the most informative reviews is that on atmospheric conditions. Modern textbooks are still weak and indefinite on the kata thermometer and the effective temperature. The uses of the kata thermometer, its calibration and its limitations are very well described and nomograms for comparing kata readings, ordinary readings, and air velocity with relation to conditions of comfort are figured. A comparison of the American effective temperature methods of estimating comfort conditions with the kata method is given. With a balance of favourable opinion, inclining to the latter. The important conclusion of Vernon is worth while recording here that to reduce an over-heated body of a man engaged in hot and heavy work, the temperature should be first reduced, then the clothing. Whilst increase of air velocity has little effect. There is a great field of work open for this sort of study in India—the observations on the Cotton Industry Commission and of Col. Jolly in Burma are the only systematic records available.

The last chapter deals with active immunization and the work leading up to the Schick's and Dick's reactions are succinctly given. This work and the active immunization by toxin and toxoid-antitoxin are known to those interested in prevention. The point is noted by Dudley, however, that a secondary exposure to infection (natural or artificial) produces a greater and more rapid immunization than is accounted for by the dose alone. A primary sub-clinical infection or stimulus, followed later by a dose of T. A. T. will give a rapid and large immunization. This explains some of the phenomena exhibited by immunization by T. A. T. The claims of benefits of wholesale immunization by T. A. T. made by certain observers, especially American, are very critically examined and mostly found wanting. The claims of special measures made during the natural decline of an epidemic period will seldom stand the test of time. In New York for instance, Forbes in 1926 wrote that "coincident with active immunization against diphtheria, the death rate fell from 12.7 per 100,000 in 1918 to 7.9 in 1926." But in 1927 the death rate was 12.7 per 100,000 and 10.7 in 1928. Other instances are cited. Dr. Haslam points out that it is futile to quote death rates for an odd year or two without reference to the existing trend as evidence of the success of immunization. There is probably no more common mistake made by enthusiasts for new methods. Dr. Haslam's English mind is suspicious of "slogans" which are so popular in America, but recognizes that so far as concerns the expediency of methods of propaganda in any place, those on the spot are the only judges.

It will be seen that the contents of the book appeal to every physician, and more especially to those actively interested in preventive medicine. The omission of certain subjects noted at the beginning of this note is regretted only because Dr. Haslam could have dealt with these also so efficiently.

A. D. S.

**THE AFTER-TREATMENT OF OPERATIONS: A MANUAL FOR PRACTITIONERS AND HOUSE SURGEONS.**—By P. Lockhart-Mummery, F.R.C.S. (Eng.), M.A., M.B., B.C. (Cantab), 5th Edition. London: Baillière, Tindall and Cox. Pp. IX plus 281 with 37 figures in the text. Price, 7s. 6d. net.

IN the preface to this, the fifth edition, the author draws attention to the great change which has come over the after-treatment of operations during the last twenty-five years, and claims some of the credit for this advance. The first edition was published in 1903. In the present edition the chapters on shock, post-operative thrombosis and embolism, have been largely rewritten. A chapter has been added on blood transfusion and on post-operative urinary infection. The chapters on abdominal operations have also been considerably altered.

The first chapter is introductory and deals with such post-operative questions as posture, beds, sleeplessness, pain, acidosis, thirst, flatulence, etc. Chapter II describes the treatment of the wound; the next seven chapters deal with such important matters as hæmorrhage, blood transfusion, surgical shock, infection of the urinary tract, post-anæsthetic complications, thrombosis and embolism, and rashes and drug-poisoning. The remaining ten chapters of the book are concerned with the after-treatment of operations performed on various parts of the body. Chapter V on surgical shock is particularly valuable, especially to young surgeons, and ends with the important observation that the "best results will always be obtained by preventing shock rather than by treating it." An appendix on "diets" completes the book.

It is not necessary to describe at greater length so well known a book. It is of convenient size, cheap, and contains nothing but practical instruction, invaluable to all those who have not had the opportunity of learning by personal experience—sometimes a lengthy and bitter process, particularly for the patient!

F. P. C.

**A MANUAL OF MIDWIFERY FOR STUDENTS AND PRACTITIONERS.**—By Henry Jellet, B.A., M.D. (Dub. Univ.), F.R.C.P.I., L.M. and D.G. Madill, B.A., M.B., B.Ch. (Dub. Univ.), L.M. Fourth Edition. London: Baillière, Tindall and Cox. 1929. Pp. XII plus 1280 with 570 figures in the text. Price, 25s. net.

JELLETT AND MADILL'S is one of the standard books on midwifery in the English language. The last edition appeared nearly 8 years ago so that this new edition is welcome. We gather that the revision has mostly been carried out by the second author as the former has now retired from active practice.

This edition appears to be somewhat larger than the previous one. The book has been revised throughout and the chapters on eclampsia, the treatment of contracted pelvis, and the ætiology of antepartum hæmorrhage have been rewritten, and new sections on anæsthesia during labour, pyelitis during pregnancy, nephritic toxæmia and pre-eclampsic toxæmia have been added.

This edition has maintained the high reputation of its predecessors and at the same time has been brought thoroughly up to date. We can strongly recommend it to both student and practitioner.

The format of the book is very satisfactory; the paper, though opaque, is thin enough to allow the twelve hundred odd pages to be bound in a volume of reasonable size. The printing is clear and the illustrations are well reproduced.



## Annual Report.

### ANNUAL REPORT OF THE EXECUTIVE HEALTH OFFICER, BOMBAY, FOR THE YEAR, 1928. BOMBAY, *TIMES OF INDIA* PRESS, 1929.

THIS report by Dr. J. E. Sandilands, M.D., D.P.H., contains much interesting matter.

The area of Bombay city is 23.54 square miles, and its estimated population in the middle of the year 1928 was 1,298,708. The birth rate was 18.5, per mille, if calculated on the estimated population, or 20.4, if calculated on the figures of the 1921 census. As is well known, birth rates in the great Indian cities are not a true measure of the fertility of the population, owing to the prevalence of the custom of married women going back to their homes in the *mofussil* for their confinement. The birth rate in 1928 was the highest recorded since the introduction of records of births in 1866. As usual, the number of births in the second half of the year was considerably higher than in the first half of the year. Especially high birth rates were recorded among Anglo-Indians (46), and Jews (31); the lowest birth rate was that for Europeans (9.7).

Deaths numbered 27,312 as against 27,633 in 1927; a ratio of 21.0 per mille, and the lowest figure so far on record for the city. Males greatly outnumber females in the city, and accordingly show a much greater total number of deaths; actually the death rate is higher among the female population. In Diagram B a comparison is shown between the death rates from the different diseases for (a) the years 1923-27, and for 1928; this diagram brings out with very striking clearness the tremendous importance of respiratory diseases as far and away the most outstanding cause of death; the mortality from plague is almost insignificant. The chief figures run for death rates due to: respiratory diseases 8.1, congenital debility and diseases of early infancy 2.4, tuberculosis 1.3, ague and remittent fever 1.1. The two peaks in the mortality curve for 1928 occurred in April, due to smallpox, and in November due to malaria. The figures for death rates by wards are somewhat untrustworthy, as so many patients die in hospitals without their residential addresses in the city being known.

Infantile mortality was 311 per 1,000 registered births, the lowest figure so far recorded. (This figure may seem amazingly high to those accustomed to European conditions, but it is raised by a special factor. So many women go to their homes outside the city for confinement that a very large number of births registered outside Bombay; these women then return to Bombay, and if the child dies in Bombay its death—but not its birth—is recorded in the vital statistics for the city.) Infantile debility, respiratory diseases, and convulsions head the list as the three chief causes of infantile mortality. Debility and prematurity are the chief causes during the first four weeks of life, respiratory disease during the remaining eleven months of infancy. Death rates vary from 332 among low caste Hindus, and 328 among Mahomedans, to 62 among Europeans. No less than 82.9 per cent. of infantile deaths occurred among families occupying one room or less, and the proportion of deaths to births varies inversely as the number of rooms occupied by the parents.

With regard to the prevention of infantile mortality, 10 municipal nurses are employed; they paid 41,461 visits during the year to chawls and tenements, attended 1,370 confinements, and verified 5,115 birth entries. The four municipal maternity homes—including the new Worli Home, which was opened in May, 1928—admitted 2,850 women for confinement. Two infant milk depots were opened during the year for distribution daily of pure milk at a minimal price.

The Infant Welfare Society made much progress, and its skilled midwives attended 1,040 confinements during the year.

Turning to the chief epidemic and other diseases, plague was insignificant during the year—death rate 0.2. The usual measures were in force. Smallpox (0.4) was less prevalent than usual. Cholera and influenza were notably on the down grade. Pulmonary tuberculosis still contributes an annual mortality of 1.2 per mille. Two anti-tuberculosis dispensaries are at work, and three special nurses are employed in visiting the homes of the patients who attend; a total of 1,828 patients was treated at the two dispensaries during the year. The Turner Municipal Sanatorium at Bhoiwada admitted 121 new patients during the year, and discharged 124, with, in addition, 4 deaths. Of those discharged in improved health there were 56 in stage I, 22 in stage II, and none in stage III; all four deaths occurred in stage III cases.

Malaria itself was registered as the cause of 295 deaths, but in all 1,431 deaths were registered as due to ague and remittent fevers. A very large volume of anti-malarial measures was carried out during the year, but the anopheline breeding sites in Bombay are extremely numerous; open wells, cisterns, fountains and tanks, tubs, gully traps, storm water entrances, tins, pools, cellars, and low lying depressions were all incriminated in considerable numbers during the year. In all 16,317 children were examined, and the spleen rates found to vary from 1.2 to 19.8, with a general average of 6.2. Parasite rates calculated from random samples taken in different wards by the malaria inspectors varied from 2.1 to 30.4 per cent. (These figures show that, although Bombay cannot be regarded as a hyperendemic zone, yet malaria constitutes one of the most troublesome and important public health problems in Bombay.) Admissions from British troops to the Colaba hospital were 972 in 1921 and 357 in 1922, before the commencement of reclamation anti-malaria measures; these measures were introduced at the latter date, and the admission rate had sunk to 129 per 1,000 in 1928. "Malaria," however, writes Dr. Sandilands, "is widely prevalent in the city."

That there is a vigorous anti-malaria policy in force, however, is shown by the figures on p. 26 of the report, which summarize in tabular form the work carried out during the year. With regard to the issue of drugs, 76 lbs. of quinine and 96 lbs. of cinchona febrifuge were supplied, free through the municipal dispensaries to patients and others during the year.

Veneral diseases accounted for only 44 deaths registered during the year, but this is no measure of the incidence of these diseases in the community, and the special dispensary at Lamington Road, under Dr. Noronha, treated 2,942 patients during the year. This work is very heavy, and it included 789 injections of neo-arsenobillon and 1,262 of bismuth preparations, and the carrying out of 622 Wassermann tests. The incidence of gonorrhoea is almost twice that of syphilis, which is the lowest of the three venereal infections on the list.

Thirteen municipal dispensaries were open throughout the year to administer free medical relief. The attendances at these numbered 210,467, including 84,048 new cases. The special eye dispensary treated 1,281 new patients during the year.

For public health purposes, the city and island of Bombay is divided into 7 wards, 10 registration and sanitary districts, and 39 sections—each of the latter being in charge of an inspector, styled a medical assistant. There are also special staffs for maternity and child-welfare, milk and food inspection, and a veterinary section. The total quantity of milk consumed daily is 23,000 gallons, and as this works out at only 3.1 ozs. per head per day, it must be regarded as quite insufficient for a population, the great majority of whom are vegetarians. Of the milk consumed 78 per cent. comes from milch cattle stables within the city, 21 per cent. is imported by rail, and 1 per cent. by road. During the year 960 hawkers

importing milk by train were inspected; 268 of them were found to have no license, and 137 of them were carrying the milk in open cans without covers. The scheme for the abolition of stables inside the city and their transfer to rural areas outside Bombay has unfortunately been held up by legal difficulties.

With the completion of the new Tansa pipe line, the city as a whole is now provided with an adequate and constant water supply. The whole supply was chlorinated throughout the year, and no provision of any kind is made for filtration. The present sewer system is quite inadequate and the continuance of the old insanitary basket privies leads to a gravely insanitary system. The only satisfactory feature of present day conditions is that the Corporation pay a subvention of Rs. 100 to landlords for each privy converted into a water closet within three months of due notice having been received; and landlords are beginning to realize that this enhances the value of their property.

With regard to housing, financial considerations and the difficulty experienced in preserving a balance between the number of insanitary dwellings demolished and the number of new tenements provided to take their place has led to the postponement of action in a number of areas. Since the year 1898 the City Improvement Trust has provided 47,342 new tenements as against 32,522 tenements demolished.

The volume also includes minor reports in addition to that by Dr. Sandilands. Dr. P. T. Patel contributes a report on the working of the Arthur Road Hospital, and another on the Maratha Plague Hospital for the year. Smallpox was prevalent during the year, and reached its maximum with 140 admissions in March. Case mortality was 8 per cent. among the vaccinated as against 41 per cent. among the unvaccinated. There were 129 admissions for plague during the year; and anti-plague bacteriophage was under trial but gave disappointing results. The municipal laboratory was in charge of Dr. C. Coutinho, and carried out 5,599 examinations during the year. Thirty per cent. of samples of *ghi*, 26 per cent. of those of butter, and 20 per cent. of those of tea dust, were found to be adulterated. Full details of the results of water analysis are given in tabular form. Dr. K. N. Choksy reports on the vaccination work of the year. The total number of vaccinations performed was 35,643, and in primary vaccinations the success rate was 93 per cent. Ninety-three per cent. of the Haj pilgrims passing through Bombay during the year were vaccinated in Bombay before embarkation.

## Correspondence.

### CARBON TETRACHLORIDE, MERCK.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—My attention has been drawn to the article by Dr. S. C. Nag, entitled "Notes on the Use of Carbon Tetrachloride," published in your journal for December, 1929, which describes various toxic symptoms that in his cases arose after the administration of this drug. The discussion at the end of the article leaves it open to doubt whether these symptoms may possibly be attributed to impurities in the drug used. Since this latter was Carbon Tetrachloride "Merck," the whole matter was placed in the hands of my Analytical and Pharmacological Laboratories for comment.

They now report that in their opinion the toxic effects observed cannot possibly be attributed to the Carbon Tetrachloride "Merck." This preparation is manufactured to conform with the requirements of all pharmacopœias. Apart from this, it undergoes further tests to guarantee its complete freedom from chlorine, carbon disulphide, phosgene and other organic impurities; additional tests are made regarding its specific gravity and boiling point.

I should like to take this opportunity of referring your readers to Dr. Heraldo Maciel's article on "The Use of Carbon Tetrachloride as an Anthelmintic," which appears in E. Merck's *Annual Report*, 1929, Part 3.

Dr. Heraldo Maciel, who is Staff Surgeon in the Brazilian Navy (D. P. H., Rio de Janeiro), occupies such a position that he can speak authoritatively on this subject. He states:

..... "The innocuity which we have observed in the medicament we attribute mainly to the age of the majority of our patients (generally young men of from 16 to 30 years of age), to the small doses, and finally to the purity of the product which we use, namely necatorine or Carbon Tetrachloride extra pure 'Merck'."

I may say, therefore, that the toxic effects, observed by Dr. S. C. Nag, must definitely be attributed to other causes.—Yours, etc.,

E. MERCK.

DARMSTADT,  
17th February, 1930.

### LIQUID EXTRACTS OF KURCHI.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In connection with my paper on "The Use of a Standardized Preparation of the total alkaloids of Kurchi bark in Amœbic Dysentery" in your issue for February, 1930, the following corrections should be made:—

(i) On p. 81, first column, line 20, the paragraph should read:—

"I had samples purchased in the bazaar of the preparations by Messrs. B. K. Paul, the Bengal Chemical Co., Messrs. Smith Stanistreet, The Union Drug Co., and Dr. Bose's Laboratory analysed with reference to their alkaloidal content, and the total alkaloidal content was found to vary from 0.214 to 0.128 per cent. (1928)."

These examinations were carried out on samples purchased in the bazaar, and the analyses were carried out in the middle of 1928. To-day in 1930 I am assured that the state of affairs is very much better. The watery extracts which were in use in 1928 are now not in use to any extent, and have been generally replaced by alcoholic extracts which are well up to standard strength. This is as it ought to be.

(ii) On p. 81, second column, line 18, please read "Campbell Medical School Hospital, Calcutta," and not "Carmichael Hospital" as stated.—Yours, etc.,

A. R. MAJUMDAR, M.B.

CAMPBELL HOSPITAL,  
Calcutta, 6th March, 1930.

(Note.—With regard to the first correction, we believe that the paragraph as originally printed was what was sent in by our contributor. For the second mistake, we must take the blame for an editorial error. Dr. Majumdar's entire article had to be re-typed after correction before sending to press.—EDITOR, I. M. G.).

### THE PURITY OF TUBE WELL WATERS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—Lieut.-Colonel Clemesha's letter in your February issue on the above subject contains a suggestion of great value. We have been much puzzled in Rangoon by the bacteriological findings in tube well waters after heavy rainfall.

Lieut.-Colonel J. Morison, I.M.S., when in charge of the Pasteur Institute here, believed that most of our bacillary dysentery was due to contamination of the water supply. The main water supply of the town is from Hawga Lake a reservoir some 14 miles from Rangoon. This supply is chlorinated, though the protection afforded by this measure appears to be reduced by leaks in the distribution system. Only a relatively small proportion of our supply comes from

tube wells, which are for the most part over 150 feet deep.

I am loath to believe that these wells have been to any great extent responsible for our bacillary dysentery outbreaks which occur principally in the fly breeding season, but, following up Lieut.-Colonel Morison's suggestion, Dr. Mackey and I have examined the tube well waters with the results noted in our article in your January issue.

Lieut.-Colonel Clemesha's theory appears to me the probable true explanation, and I am grateful to him for making it and hope to carry out a test on a cement grouted well during the present year. The well I propose to grout is one which is 168 feet deep, does not pass through an impermeable layer, and which has shown consistent evidence of pollution following rainfall, though the water is of a high standard of purity in the dry weather.—Yours, etc.,

G. JOLLY,

Lieut.-Colonel, I. M. S.

DEPARTMENT OF PUBLIC HEALTH, BURMA,  
SECRETARIAT, RANGOON,  
5th March, 1930.

#### COCONUT MILK AS AN ANTHELMINTIC.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—A European patient of mine who suffered from symptoms of cardiac distress sent me one day a dry specimen of an intestinal parasite of which he said he passed quantities at intervals. I only saw him again after a month or so, when I remarked his general physical improvement, and he told me of an unusual experience he had gone through. He said that shortly after consulting me, he was on tour and one day drank the water of a tender coconut. A day or so later he passed what, from his description of it, appears to have been a matted clot of an entire tapeworm.

My cook, who has a knowledge of preparing fresh infusions and "teas" from Indian herbs, has now on two occasions prepared a warm drink of coconut "milk" and common salt for children suffering from a bloated abdomen and such other symptoms of hookworm infection as anemia and breathlessness. On both these occasions, although no definite examination of the stools could be made nor a specimen brought, the statement was made that the children were very much better after having passed a "handful" of tiny worms.

One's curiosity having been aroused, this remedy as an anthelmintic has been vouched for on more than one occasion. I shall be much obliged for the opinion of a food analyst, or, through the medium of your columns, for a scientific explanation of the peculiarly beneficial action of the water of the tender coconut, or the "milk" of the adult coconut in such cases.—Yours, etc.,

H. STOKES.

WESTCLIFF, KOTAGIRI, NILGIRIS,  
SOUTH INDIA,  
7th February, 1930.

#### "APHONIA AFTER QUININE ADMINISTRATION."

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—In the January 1930 issue of the Gazette Dr. N. S. K. Iyer reports a case of aphonia following quinine administration.

Whilst I was in charge of a dispensary at Kalva in the Kurnool district in 1902, there came to me a Mahomedan boy of 8 years old, asking for a dose of purgative. I gave him, I remember, a dose of Pulv. Jalapæ Co., according to his age, at about 8 a.m. At noon on the same day his father brought him to me, complaining that the boy could not speak, although he was all right in all other respects. I wished to keep the patient under observation until the

evening, but, to satisfy the father, I gave him half an ounce of Aqua Chloroformi, with a request that the boy should be brought to the dispensary in the afternoon. When he came, I was glad to note that he was able to talk as usual. Subsequently I was informed by the compounder that the bottle contained plain water instead of Aqua Chloroformi.

Therefore a simple purgative can also produce "aphonia."—Yours, etc.,

S. A. JEGARAYA MUDALIAR, L.M.P.,

Civil Assistant Surgeon (retd.).

ST. ANTHONY'S COTTAGE,  
COIMBATORE, SOUTH INDIA,  
30th January, 1930.

#### MILK INJECTIONS IN SKIN DISEASES.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—The treatment of eczema and psoriasis by intramuscular injections of milk deserves to be better known. I have recently treated a series of such cases by this method with very good results. The milk is sterilized by heating in a test-tube, and the injection given intramuscularly into the buttock, twice a week. I commence with a dose of 1 c.c., and increase the dose by 1 c.c., up to a dose of 5 c.c. Courses of from 6 to 16 such injections give very satisfactory results in such cases.—Yours, etc.,

RAM PROSAD,

Medical Officer.

SARSO DISPENSARY,  
P. O. MANIGATHI, DARBANGA,  
4th March, 1930.

## Service Notes.

#### APPOINTMENTS AND TRANSFERS.

LIEUT.-COLONEL W. L. Harnett, M.B., F.R.C.S., I.M.S., Superintendent, Campbell Medical School and Hospital, is appointed to act temporarily as Professor of Clinical and Operative Surgery, Medical College, and Surgeon to the College Hospital, Calcutta, *vice* Lieut.-Colonel H. B. Steen, M.D., I.M.S.

Lieut.-Colonel J. S. O'Neill, M.C., I.M.S., Civil Surgeon, from Bareilly to Cawnpore.

Lieut.-Colonel B. E. M. Newland, I.M.S., Civil Surgeon, from Moradabad to Bareilly.

The services of Lieut.-Colonel G. T. Burke, M.D., I.M.S., are placed permanently at the disposal of the Government of the United Provinces, with effect from the 16th February, 1924.

The services of Major P. N. Basu, I.M.S., are placed temporarily at the disposal of the Government of the United Provinces, with effect from the date on which he assumes charge of his duties.

Major W. P. Hogg, D.S.O., M.C., I.M.S., an Officiating Agency Surgeon, is posted as Agency Surgeon in Bhopal, with effect from the 17th February, 1930.

In the previous orders placing the services of Major M. Fazluddin, O.B.E., I.M.S., temporarily at the disposal of the Government of the Punjab for employment in the Punjab Jail Department for the words "with effect from the 1st January, 1930," read "with effect from the 20th January, 1930."

Major H. E. Murray, M.D., M.Ch., I.M.S., is appointed as Civil Surgeon, Bakarganj, with effect from the forenoon of the 21st March, 1930, *vice* Major S. A. McSwiney, I.M.S., granted leave.

Major W. C. Spackman, F.R.C.S.E., M.B., B.S. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.T.M. (Lond.), I.M.S., is appointed as Officiating Professor of Midwifery and Gynaecology, Grant Medical College, and Superintendent, Bai Motlibai and Sir D. M. Petit Hospitals, during the absence on leave of Lieut.-Colonel Hamilton.

Captain D. P. Bhargava, M.B., F.R.C.S.E., I.M.S., whose services have been temporarily placed by the Government of India at the disposal of the U. P. Government, to Agra as Principal, Medical School.

Captain W. H. Critien, I.M.S., is appointed to officiate as an Agency Surgeon and is posted as Medical Officer and ex-officio Vice-Consul, Sistan, with effect from the 5th February, 1930.

#### LEAVE.

Major-General G. Tate, M.B., K.H.S., I.M.S., Surgeon-General with the Government of Bengal, is granted, preparatory to retirement, leave on average pay for two months and four days combined with leave on half average pay for three months and 28 days, with effect from the 15th March, 1930.

Lieut.-Colonel W. J. Simpson, I.M.S., an Agency Surgeon, is granted leave on average pay for 6 months combined with leave on half average pay for 2 months, with effect from the 17th February, 1930.

Lieut.-Colonel A. F. Hamilton, M.B. (Lond.), F.R.C.S. (Eng.), I.M.S., Professor of Midwifery and Gynaecology, Grant Medical College, and Superintendent, Bai Motilbai and Sir D. M. Petit Hospitals, is granted leave with effect from the 22nd March, 1930, or subsequent date of availing on average pay for two months and eighteen days followed by such leave on half average pay as will bring the total period of leave to eight months.

Lieut.-Colonel H. Ross, C.I.E., O.B.E., I.M.S., Civil Surgeon, Cawnpore, leave on average pay for twenty-three days followed by leave on half average pay for eleven months and seven days (total twelve months), with effect from 20th March, 1930, or the date of availing.

Major S. A. McSwiney, I.M.S., Civil Surgeon, Bakarganj, is granted leave for eight months, with effect from the 18th March, 1930.

#### PROMOTIONS.

The King has approved the promotion of Major D. F. Murphy, M.C., M.B., F.R.C.S.E., I.M.S., to the rank of Brevet-Lieut.-Colonel, with effect from the 1st January, 1930.

#### Captain to be Major.

E. T. N. Taylor, M.B. Dated 20th February, 1930.

#### Lieut. to be Captain (Prov.)

M. G. Kelly. Dated 7th March, 1930.

#### RETIREMENTS.

Subject to His Majesty's approval, Lieut.-Colonel H. H. Broome, C.I.E., M.B., F.R.C.S., I.M.S., has been permitted to retire from service from the 6th March, 1930.

#### I. M. S. DINNER.

THE Annual Dinner of the Indian Medical Service will be held in London at the Trocadero Restaurant on Wednesday, the 18th June, 1930. Full particulars can be obtained from the Honorary Secretaries, Indian Medical Service, Annual Dinner, 31, Wimpole Street, London, W.1.

## NOTES.

### "THE ECLIPSE SPRAYER."

THE disinfection of hospital wards, operating theatres, living rooms, theatres, cinema halls, and the like by spraying is now a universal practice. Yet many types of hand sprayers are unsatisfactory; intricate parts are apt to get out of order, the bucket type of machine has to be carried about, and "back-wash" is often troublesome. Some machines are too heavy; several leave the operator with only one hand free to spray, the other being used to carry the container.

A firm at Home which has paid especial attention to this problem for some years is the Eclipse Spraying Co., Ltd., Rawlings Road, Bearwood, Smethwick, England, and their "Eclipse No. 1 Sprayer" gets out of the rut of following stereotyped patterns, and is both ingenious and cheap. In this the spraying portion of the apparatus is complete in itself: the solution

used for spraying is placed in a bucket or similar container, the solution is drawn from the container by suction action, and up to 200 feet of hose can be used. Both hands of the operator are left free, and the first stroke on the sprayer draws in the fluid from the container, whilst the second ejects it in spray form. Spare "lances" may be had to increase the distance between the actual pump and the nozzle, whilst spraying can be stopped instantaneously by a slight sharp pull back of the piston rod. The apparatus is especially suitable for lime-washing and creasote spraying, whilst veterinary workers will be interested in the modifications for cattle drenching and injecting. The complete No. 1 outfit costs only 30s.

A modification of this sprayer is the "Eclipse Satchel Vaporizer," which is specially designed for hospitals, sanatoria, cinemas, etc. In this the satchel containing the solution is hung from the operator's right shoulder, like a military haversack, leaving both hands free for operating the spray. This is issued in two sizes: for 4 pints at 30s. and for 8 pints at 33s.

The uses to which such instruments can be put are almost innumerable, whilst the firm in question is a leading one in the study of this subject, and the production of new and suitable apparatus. The Indian agents are Messrs. Barlow & Co., P. O. Box No. 49, 37, Strand Road, Calcutta.

### "ANTIVIRUSES BIOTHÉRIB."

IN connection with the note on p. 60 of our issue for January, 1930, on a staphylococcus antiviruses, we have received a letter from Messrs. G. Loucatos, P. O. Box No. 783, Shushtary Building, 15-A, Elphinstone Circle, Bombay, drawing attention to the fact that for the last six years they have issued five kinds of antiviruses, as agents for La Biothérapie, Paris. La Biothérapie, Paris, are the makers of Bilibaccine, under the direct personal control of Professor Besredka himself, who also supervises the manufacture of their Antiviruses Biothérrib.

These viruses have been the subject of long and exacting tests under scientific control, in both clinical and practical fields, and have recently been adopted officially by the French Government by the Ministry for the Colonies for use in all French colonial hospitals and infirmaries. The antiviruses stocked, which are sterile filtrates of broth cultures, are as follows:—

Antivirus	Streptococcic	Biothérrib.
"	Staphylococcic	"
"	Strepto-Staphylococcic	"
"	Coli-bacillary	"
"	Puerperal	"

Clinical reports from French hospitals report the special value of these preparations in puerperal sepsis, boils, phlegmons, osteomyelitis, anal fistulae, folliculitis of confluent type, blepharitis and conjunctivitis, and other septic conditions. A small brochure, issued from Paris, gives details of cases reported, and instructions for the use of these Antiviruses Biothérrib. This may be obtained on application to Messrs. G. Loucatos.

### "ELIXOID" EPHEDRINE COMPOUND.

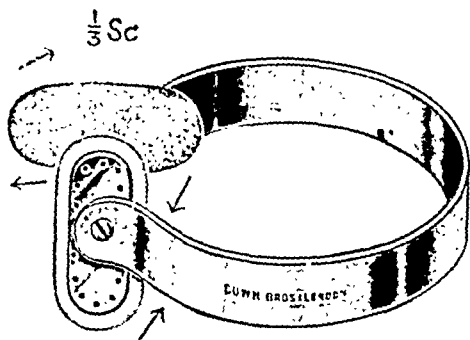
AN elixir agreeable to the palates of children and fastidious adults is now issued by Burroughs Wellcome & Co. under the name of "Elixoid" Ephedrine Compound. The value of ephedrine in asthma, hay-fever and other catarrhal conditions of the nose and naso-pharynx is now established, and its usefulness in mild and moderate cases of whooping-cough is fully recognized. "Elixoid" Ephedrine Compound is prepared with the pure laevo-rotatory alkaloid and is an acceptable means of administering ephedrine to children and to adults who prefer fluid medicine.

Issued in bottles of 4 fluid ounces.

### A NEW VARICOSE VEIN CLIP.

THE spring clip shown in the accompanying illustration has been designed by Messrs. Down Bros., Ltd.,

21 and 23, St. Thomas's Street, London, S.E.1, at the suggestion of Mr. R. Davies-Colley, C.M.G., M.Ch., F.R.C.S., to take the place of an assistant in the operation of treatment of varicose veins by injection.

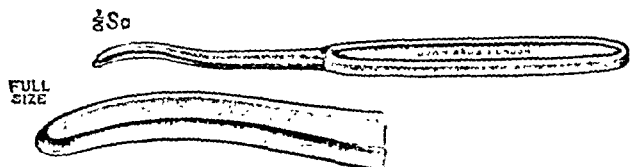


It consists of two padded metal plates connected by a horseshoe spring, which, when applied over the site of an injection, exerts sufficient pressure to prevent circulation through the vein while subsequent punctures are being made in other parts of the vein.

This clip will be of interest to many practising surgeons in India, we believe.

#### A MODIFIED FARABEUF RASPATORY.

THE illustration below shows a modified form of Farabeuf's raspatory made for Lieut.-Col. J. N. Duggan, I.M.S., by Messrs. Down Bros., Ltd., 21 and 23, St. Thomas's Street, London, S.E.1.



"The standard form of rugine designed by Farabeuf of Paris for use on the long bones was found to bring the hand somewhat inconveniently near the work" writes Col. Duggan, "while the longer rugines designed by Pierpoint and Mitchell are rather heavy for fine work round the orbit. It is thought that the rugine illustrated above will be found convenient for the delicate and precise work which falls to the lot of an ophthalmic surgeon."

#### "DIGINUTIN."

##### A New B. W. & Co. Digitalis Preparation.

"DIGINUTIN"—a new Burroughs Wellcome & Co. product—is a stable solution of the total glucosides of digitalis leaf free from inert extractive matter. Specimens biologically tested after storage for more than twelve months have shown no diminution in activity and there seems to be no reason why the solution should not retain its full potency for many years.

It is not suggested that "Diginutin" should replace "Tabloid" Digitalis Leaf, but, being a stable solution, it may be preferred by some practitioners to the tincture. Compared even with preparations of the dried leaf, the new product offers certain advantages. Being in solution it may be expected to produce a more rapid response than the leaf, owing to more rapid absorption. Further, the physiological standardization of the solution is more accurate, owing to the absence of inert vegetable matter.

The potency of "Diginutin" is adjusted to that of the B. P. tincture and is controlled by physiological tests.

Clinical reports indicate that even after long keeping it is uniformly active, reliable and equal in effect to equal doses of the fresh official tincture.

Issued in bottles of 1 fl. oz. and 8 fl. oz.

#### NUTRITION.

Nutrition is a new small trade journal issued by the makers of Glaxo, of which we have received a recent copy, Vol. 1, No. 3. It contains a good deal of interesting information with regard to recent advances in modern dietetics and vitamin therapy. The editorial in this issue reviews recent advances in connection with the synthesis of thyroxin, insulin, and the use of old filtered broth cultures in the local treatment of bacterial infections. An article of special interest is one of the uses of vitamin D and calcium in delayed union of fractures. These are given hypodermically, the calcium being in colloidal form, and the emulsion made with olive oil. "Colloidal calcium with ostelin ampoules." Five cases are quoted where results were excellent. A further use for the same preparation is in the treatment of early cases of pulmonary tuberculosis, where much improvement may result.

The Indian agents for Glaxo are Messrs. H. J. Foster & Co., Ltd., P. O. Box No. 202, Bombay.

#### ELECTRO-MEDICAL APPARATUS.

AN interesting catalogue of electro-medical apparatus which we have recently received is one from Messrs. Newton & Wright, 471/3, Hornsey Road, London, N. 19—their publication No. E/29. This does not deal with ultra-violet and diathermy apparatuses, which are dealt with in a separate catalogue. The present catalogue, however, will be of interest to the general practitioner; types of galvanic and faradic batteries are described and listed; a universal machine for general electro-medical work, sinusoidal apparatus, vibrators for massage, electrodes and accessories, a Bergonie apparatus, and local and general heat and light baths.

## Publishers' Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 reprints *gratis*, if asked for at the time of submitting their manuscripts.

Communications on Editorial Matters. Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o The Calcutta School of Tropical Medicine, Central Avenue, Calcutta.

Communications for the Publishers relating to Subscriptions, Advertisements, and Reprints should be addressed to THE PUBLISHERS, Messrs. Thacker, Spink & Co., P. O. Box No. 51, Calcutta.

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## Original Articles.

## STUDIES IN UNTREATED MALARIA.

## I. A CASE OF EXPERIMENTALLY INDUCED QUARTAN MALARIA.

By R. KNOWLES,

LIEUTENANT-COLONEL, I.M.S.,

Professor of Protozoology,

and

ASST. SURGN. B. M. DAS GUPTA,

Assistant Professor of Protozoology,

Calcutta School of Tropical Medicine and Hygiene.

## INTRODUCTION.

DESPITE the immense amount of research work on malaria during the present century, a little reflection will show how numerous and important are the gaps in our knowledge with regard to this disease. Thus the following are but a few of the many problems with regard to malaria which await solution:—

1. What is the natural death rate in untreated cases of malaria? No figures that we have had access to give any information on this point. The latest available *Annual Report of the Public Health Commissioner with the Government of India*—that for 1927—states that 3,451,454 deaths occurred from fevers in the population of 241,471,383 for which returns of vital statistics are received; a death rate of 14.22 per mille. Nearly all of this mortality was due to malaria, since relapsing fever only affected a few restricted areas, deaths from enteric fevers numbered less than 12,000, and so well is kala-azar now controlled by treatment that only 14,917 deaths from this disease were recorded in British India in 1927.

The corresponding admissions for malaria to hospitals and dispensaries in the British provinces totalled 8,398,775 in 1927, but this must represent only a small fraction of the total incidence of the disease, which must be placed at some six or seven times this figure. The state of affairs with regard to the dispensary "treatment" of malaria in India has been dealt with in faithful detail by Proctor (1927). Forty-eight per cent. of 698 cases observed in a rural area only attended a dispensary once, and only 20 per cent. put in two attendances. If the patient brought a bottle with him he received three doses of quinine mixture; if he brought no bottle he received only one dose. It is probable that most persons who suffer from malaria in India get one or more doses of some medicine or another; but in the vast majority of cases this is represented by some indigenous country medicine which has no lethal action whatever on the parasites. We doubt whether more than one in every five hundred patients who contract malaria annually in India receives a sufficiently thorough and

prolonged course of quinine treatment to eradicate the infection from his system. On adding together the figures for the distribution of quinine and cinchona febrifuge for the different provinces given in the same report, we find that less than 30,000 lbs. was distributed during the year, or approximately 432 million grains. This would represent a consumption of less than  $1\frac{1}{2}$  grains per head per annum for the whole population of India and Burma. If we put down the total incidence of malaria cases per annum at about 50 million a year, this would represent only an average of 8.6 grains per case by way of treatment.

It will be seen from these figures how impossible it is to arrive at the natural case mortality in malaria. For treated patients figures are of course available. The biggest collection that we have come across is that quoted by S. P. James (1922, p. 1631) from returns by the Sanitary Commissioner with the Government of India. It is as follows:—

Years.	Class of patients.	Cases treated in hospital.	Case mortality per cent.
1903—1907	British troops ..	63,597	0.16
	Indian troops ..	144,728	0.42
	Prisoners ..	189,534	0.36
1898—1907	Wives of British soldiers.	3,042	1.0
	Children of British troops.	5,128	1.68

It is a well known fact that malaria is a more fatal disease in children than in adults, and that debilitating conditions and intercurrent infections may raise the malarial mortality, whilst in such terrible epidemics as that which swept the Punjab in 1908 the case mortality may be excessive. In ordinary endemic malaria however in untreated patients, we doubt whether the natural case mortality is much higher than 2 per cent. In other words some 49 out of every 50 untreated patients recover spontaneously from their attack of malaria.

*What is the mechanism of this recovery?* It is one of the most fundamental, but unanswered, problems in malariology, and a lifetime of study would be too short a period to devote to it. Christophers (1924, 1925) in his classical study of malaria in the Singbhum district has shown how the child community in a hyperendemic area gradually acquires immunity (or tolerance) to malaria with increasing age, whilst several other observers have commented on the same phenomenon. What we wish to know, however, is the mechanism by which immunity (or tolerance) is acquired in the individual. There are theories enough in the literature, but, as far as we



know, very little direct experimental observation on this point.

2. What are the relative intensities in infections with *P. vivax*, *P. malariae*, and *P. falciparum* respectively? Also what is the febrile threshold in infections with these three species? Ross and Thomson (1910) have supplied a partial answer to the latter question, but much further study of it is wanted.

3. We are very ignorant with regard to gametocyte production by the three species of parasite. When do gametocytes first appear in the peripheral blood? Some authors state that they appear late in the disease—some 8 to 10 days after the first rigor; others that they may appear quite early, at about the third or fourth day after the first rigor, or even earlier. What are the factors which lead to the production of gametocytes? How does their number correlate with the schizogony cycle? The best paper dealing with this subject that we know is that by Sinton (1926); but again further work is wanted.

4. A full study of the morphology of the malarial parasites by good cytological methods is badly wanted. We are even ignorant at present as to whether schizogony occurs by mitosis, as stated by Schaudinn many years ago, or by amitosis. Further, only when such a careful cytological study has been carried out, will it be possible to state definitely whether one or two species of parasite are included under the name *Plasmodium falciparum*.

5. The exact relationship of the schizogony cycle of the malaria parasites to the temperature chart was the subject of much early work by the Italian pioneers. In view, however, of the findings by S. P. James (1926, 1926a) with regard to the difference between primary and relapsing benign tertian malaria, a re-investigation of this problem is called for.

#### Methods and Technique.

It was a consideration of these and other allied problems that led us some nine months ago to completely alter our methods of study of malaria at the School and to make a special study of untreated cases. This was made possible by the fact that some of our colleagues at the Calcutta School of Tropical Medicine from time to time have treated cases of neuro-syphilis, and even of tertiary syphilis, by experimentally induced malaria. The course of untreated malaria can be very well studied in such patients. The case of experimentally induced quartan malaria to be described belongs to this group; the patient was under the care of Dr. Shivapada Bhattacharjee, M.D., Acting Professor of Tropical Medicine at the School, and we are most grateful to him for the full facilities which he gave us for studying the case.

With regard to technique, the parasite counts have all been carried out by the method advo-

cated by Sinton (1924). We have found this method a most admirable one. The original suspension of fowl's red blood corpuscles was diluted 1:8, and counted sixteen times; the figures ranged from 24,040 to 28,580 per c.mm. at the extremes, with a mean at 26,558 per c.mm. This was next diluted down to a strength of 10,000 corpuscles per c.mm. The suspension, which is kept in an ice chest, has kept in perfect condition since it was prepared nine months ago.

In staining the films of mixed suspension of fowl's corpuscles and patient's blood, the use of Leishman's stain is rather apt to lead to deposit and difficulties in counting. The suspension contains a trace of mercuric perchloride and is definitely acid; hence it is better to use an alkaline stain. Details are as follows:—

- (1) The film is fixed with methyl alcohol of pH 6.8.\*
- (2) Distilled water rendered very slightly alkaline, pH 7.2, by the addition of N/10 NaOH is used. The film is washed with this.
- (3) Stain for 20 minutes with Giemsa's stain; strength 1 drop to 1 c.c. of distilled water of pH 7.2.
- (4) Wash with distilled water, pH 7.2.
- (5) Allow the film to dry in air. Do not blot.

This technique gives a nice clean film, fairly deeply stained. The counts have all been carried out by the senior author (R. K.) with a binocular Leitz microscope, fitted with an apochromatic 1/12th inch oil immersion lens. In almost all instances the number of parasites corresponding to 250 nucleated red corpuscles has been counted; but occasionally when the infection was extremely heavy, counts have had to be made against 100 nucleated red cells.

Each parasite is entered separately on the record for each day's count. In order to subdivide the schizogony cycle into its constituent elements we have recorded the parasites under the following headings:—

- (a) Free merozoites, unattached to red corpuscles. These are only seen in close proximity to the time of rigor.
- (b) Rings, still preserving the ring outline, and with the vacuole present. The "ring" is of course a young trophozoite.
- (c) Growing trophozoites, with chromatin undivided.
- (d) Schizonts, showing division of the chromatin.
- (e) Mature rosettes in which the merozoites have developed fully, and are distinguishable as different individuals.
- (f) Gametocytes.

The Bass cultures have all been carried out by the modification of Bass' technique advocated by J. G. and D. Thomson (1913, 1913a).

\* When we say that the pH of pure methyl alcohol is 6.8, we mean that the colour developed by adding 0.25 c.c. of 2 per cent. phenol red to 10 c.c. of methyl alcohol is the same as that shown by adding the same amount of indicator to 10 c.c. of a phosphate Sorensen buffer of pH 6.8.

(Almost all cases of malaria submitted to the department for laboratory diagnosis are now examined culturally, as it is only in this way that the true frequency of mixed infections can be arrived at, and very scanty infections not overlooked.)

It is obvious that it will take several years before sufficient observations have been collected for a full and detailed analysis in memoir form. For this reason we propose to publish from time to time in this journal the more interesting or clinically important of the cases observed, reserving a more detailed study of the whole subject for final analysis when sufficient data have been accumulated. A previous series of seven cases has previously been submitted for publication elsewhere.\* The present case constitutes the eighth of the series.

It is only when one comes to study malaria by enumerative and cultural methods that one realises what a delicacy and precision of observation such methods afford. Sir Ronald Ross (1911, *Prevention of Malaria*, p. 651) has well emphasised the necessity for statistical and enumerative methods in the study of disease, both in the community and in the individual. "As a matter of fact," he writes, "all epidemiology, concerned as it is with the variation of disease from time to time or from place to place, *must* be considered mathematically, however many variables are implicated, if it is to be considered scientifically at all. . . . And the mathematical method of treatment is really nothing but the application of careful reasoning to the problems at issue. . . . The application of mathematics to epidemiology and even pathology has suggested itself to me (and perhaps to others) for many years; and when I came to write my Mauritius report (1908), I found myself driven to make some attempt in this direction. I suggested there the name *pathometry*, which can be applied to all mathematical study of infectious disease whether in the individual or in the community."

#### Details of the Case.

J. R., Hindu male, aged 35, peon, was admitted to hospital on the 23rd January, 1930, complaining of inability to walk properly, a waddling gait and difficulty in micturition, the duration of the symptoms being six months. Ten months previously he had had a skin eruption, and the Wassermann reaction—tested in the Imperial Serologist's Department—was strongly positive. The case was thus clearly one of syphilitic paraplegia. There was no fever from the date of admission until March 5th. A Bass culture on the 23rd January gave negative results. The spleen and liver were not enlarged.

It was decided to test the effect of induced malaria on the condition present.

\* Knowles and Senior-White. "Studies in the Parasitology of Malaria." The memoir deals chiefly with the geographical, regional and seasonal distribution of the three species of *Plasmodium* in man. Accepted for publication as No. 18 of the *Indian Medical Research Memoir Series*, supplementary to the *Indian Journal of Medical Research*.

30th January.—A patient presented himself in the out-patient department, suffering from quartan malaria. Examination of blood films from this patient showed scanty rings, trophozoites, and schizonts of *Plasmodium malariae*. A culture by Bass' method showed *P. malariae* present (only). From this donor 1½ c.c. of blood was withdrawn and injected subcutaneously into patient J. R.

31st January to 16th February.—Daily blood films from patient J. R. were examined but no parasites found. On February 15th a Bass' culture of J. R.'s blood gave negative results.

This first inoculation therefore appeared to have failed.

17th February.—In the meantime the donor had been kept off treatment; he continued to attend the laboratory and his blood was examined from time to time.

On the 17th February 5 c.c. of this donor's blood was given to the patient J. R. The injection was given intramuscularly, and, as the needle was withdrawn, partly subcutaneously. Examination of films from the donor's blood showed a fair number of rings and growing trophozoites, and scanty schizonts and gametocytes of *P. malariae* present.

18th February.—One trophozoite present in a blood film from J. R. (This was presumably an injected parasite, as the films subsequently became negative.)

19th February to 3rd March.—No parasites found.

4th March.—Very scanty trophozoites and gametocytes of *P. malariae* present.

5th March.—The temperature rose in the evening to 99°F., but dropped during the night.

6th March.—Blood films showed rings, trophozoites, and schizonts of *P. malariae* present. Counts commenced. These were thereafter continued daily (with the exception of Sundays, when the laboratories are closed).

The patient had his first rigor at 6 p.m. that evening, the temperature going up to 103°F.

The subsequent course of the disease was as shown in the temperature chart (Chart 1). The daily counts were as shown in Table I. Chart 2 shows the correlation between the temperatures (as taken at the moment the blood was taken for the count), the total parasite count, and the gametocyte count per c.mm. An interesting clinical feature of the disease was that, with one exception, the rigors invariably occurred after 6 p.m.

On March 28th at 4-15 p.m. the temperature was 100°F., and the total parasite count 8,550 per c.mm. At 9-30 the same evening the patient had a rigor, and the temperature rose to 104.6°F. by 2 a.m. on the 29th. As the patient was now in rather a bad condition a single dose of 10 grains of quinine sulphate in solution was given. The effect on the count will be seen in Table I. The count dropped to 960 parasites per c.mm. the next morning, and to 520 per c.mm. the day after.

Regular quinine treatment, 10 grains twice daily in solution, was commenced on the morning of March 31st.

5th April.—After 120 grains of quinine in solution, thin and thick blood films failed to show parasites.

9th April.—After 200 grains of quinine in solution, Bass culture negative.

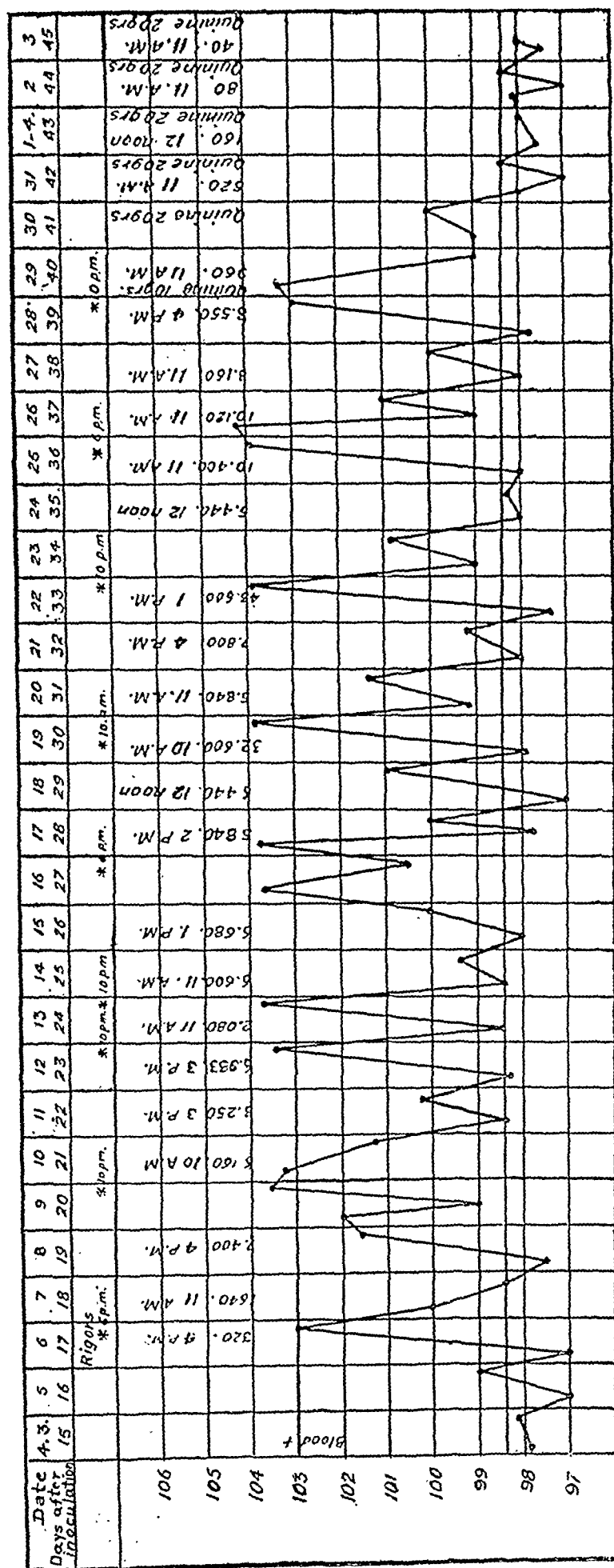
30th April.—Bass culture negative, sixteen days after cessation of all quinine treatment.

Patient discharged from hospital. He is convinced that the condition of spastic paraplegia is very much improved, but there is little objective sign of improvement. So much fuss has been made about him that the improvement appears to be due chiefly to psychic suggestion.

#### Discussion.

The case presents many features of interest, both with regard to experimentally induced malaria in man, and to the life cycle of *Plasmodium malariae*.

CHART 1.



1. *Intensity of the Infection.*—In the first place the intensity of the infection is very remarkable for a case of quartan malaria. At 4 p.m. on March 6th the temperature was 98.2°F., and the count 320 parasites per c.mm., the only parasite forms encountered being maturing schizonts. The first rigor followed at 6 p.m. the same evening. Thus the attack of quartan malaria commenced, so to speak, as a pure strain infection. The schizonts presented from 5 to 10 bits of chromatin apiece, and all clearly belonged to the same generation of parasites. From such a beginning, one would have expected a quartan fever of mathematical regularity to follow.

By 1 p.m. on the 22nd March the parasite population had reached a figure of 43,600 per c.mm., seven hours before a rigor. Such a count is almost incredible for a quartan infection, yet it was but little higher than the figure of 32,600 per c.mm. at 10-30 a.m. on March 19th, half an hour before a rigor. In general it will be seen from the table that the parasite population tended to fluctuate between 6,000 and 10,000 per c.mm. Correlated with this finding was the fact that the patient suffered fairly severely. He was at no time in any danger, but he was a very sick man.

By way of contrast to this case, one may quote the findings in a naturally contracted case of quartan infection. As follows:—

Case 2.—J. N., Hindu male, aged 26, cultivator, was admitted to hospital on the 21st July, 1929, and gave a history of having had attacks of fever on and off for the preceding five months. He had been treated by urea-stibamine injections without effect. The liver was enlarged to 1½ finger-breadths below the costal margin, and the spleen to 4 finger-breadths. The patient was markedly anæmic. Thin and thick blood films and a Bass culture taken on admission showed *P. malarie* (only).

22-7-29. 98°F. 565 parasites per c.mm.; trophozoites and gametocytes.

23-7-29. 97.6°F. (Rigor an hour later.) 700 parasites per c.mm.; mostly mature schizonts.

24-7-29. 97°F. 50 per c.mm.; trophozoites.

25-7-29. 99.6°F. Count less than 45 per c.mm.

26-7-29. 100°F. 367 per c.mm.; trophozoites and schizonts.

As there seemed to be no evidence that spontaneous cure was taking place, this patient was now put on to alkalies and quinine.

The two cases present a complete contrast to one another. In J. R.'s case, the quartan fever (as will be discussed later) was almost certainly a primary attack; in the case of J. N. the condition present was one of chronic relapsing quartan infection. In the former the counts reached a very high figure, and the disease showed no tendency towards spontaneous cure during the 24 days that the malaria was allowed to run its course; in the latter a condition of chronic relapse was associated with low counts with a tendency towards reduction of the parasites.

J. R.'s case enables one to understand the occasional reports of extremely severe, and sometimes fatal outbreaks of quartan malaria, by workers in the Dutch East Indies, such as that by Schuurman and Schuurman-ten Bokkel Huinink (1929) with regard to the marshy

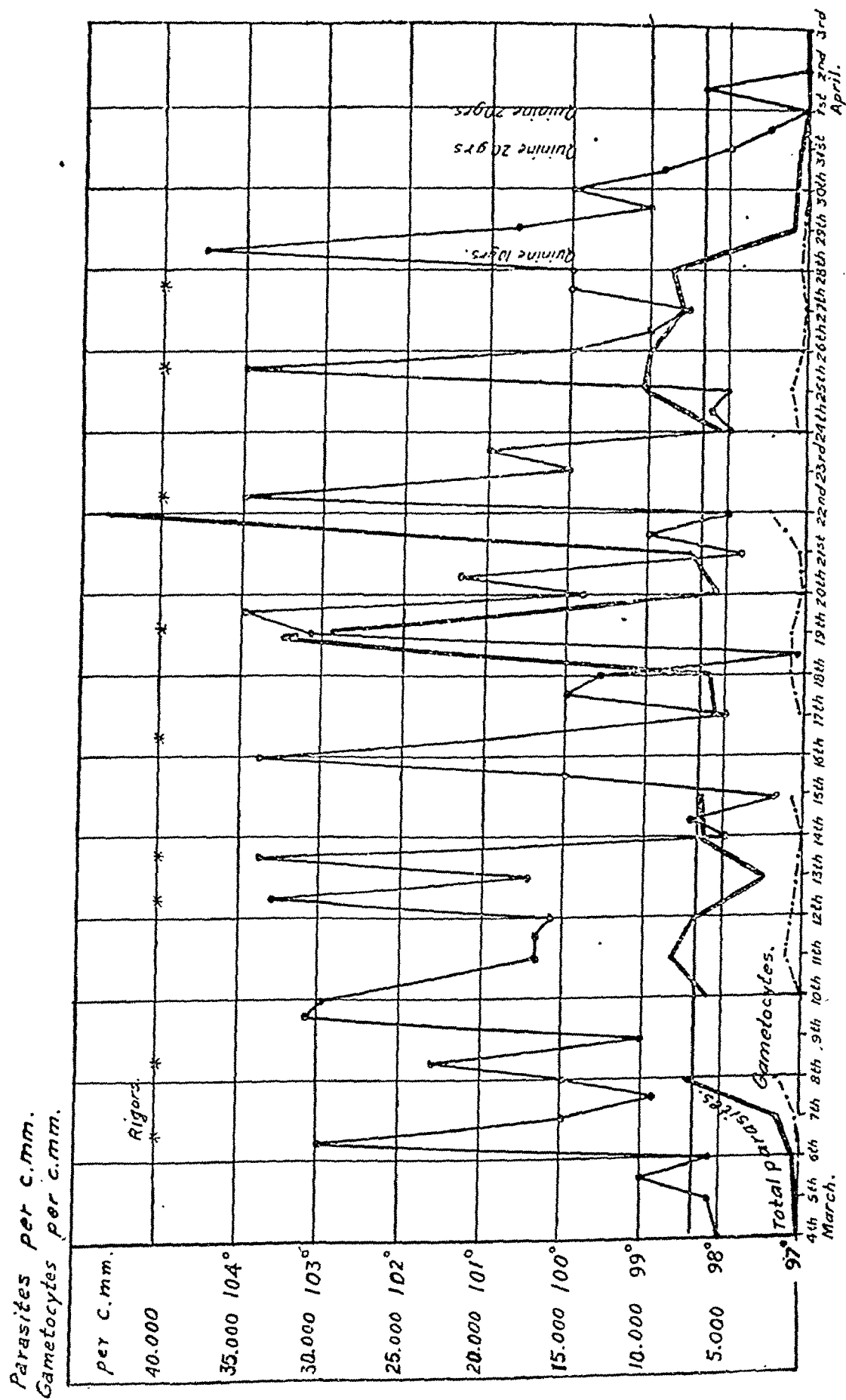
zone of Kali Rawan on the south coast of Java. It is clear that sometimes quartan malaria may become a very severe disease.

2. *Mechanism of Parasite Destruction.*—Despite the intense severity of the infection, however, the counts make it clear that there

TABLE I.—J. R. PARASITE COUNTS.  
Nearest whole figure.

Date.	Hour.	Tempera- ture.	Total parasites per c.mm.	PERCENTAGE OF						Gametocyte count per c.mm.	REMARKS.
				Free merozoites.	Rings.	Trophozoites.	Schizonts.	Mature rosettes.	Gametocytes.		
6-3-30	4 p.m.	98.2°F.	320	..	..	..	100	..	0	0	Rigor at 6 p.m.
7-3-30	11 a.m.	100°F.	1,640	..	7	83	3	..	7	120	
8-3-30	4 p.m.	100°F.	7,400	..	..	59	17	..	24	1,800	9-3-30. Rigor at 9 p.m.
10-3-30	10-30 a.m.	104°F.	6,160	..	23	71	1	..	5	320	
11-3-30	3 p.m.	100.4°F.	8,250	..	2	76	6	..	16	1,400	
12-3-30	3-12 p.m.	100.2°F.	6,933	..	4	58	29	2	7	466	Rigor at 8 p.m.
13-3-30	10-55 a.m.	100.4°F.	2,080	..	6	55	35	..	4	80	Rigor at 8 p.m.
14-3-30	11 a.m.	98°F.	6,600	..	12	86	2	..	0	0	
15-3-30	1 p.m.	97.4°F.	6,680	..	..	78	14	..	8	560	16-3-30. Rigor at 6 p.m.
17-3-30	2-30 p.m.	98°F.	5,840	..	12	85	..	..	3	160	
18-3-30	12 midday	99.6°F.	6,440	..	1	83	4	..	12	800	
19-3-30	10-30 a.m.	103.2°F.	32,600 *	57 *	4	..	1	35 *	3	800	* Or 117,000 merozoites per c.mm. Rigor at 11 a.m.
20-3-30	11-30 a.m.	99.8°F.	5,840	..	47	45	4	..	4	240	
21-3-30	3-50 p.m.	98°F.	7,800	..	2	91	1	..	6	440	
22-3-30	1 p.m.	98°F.	43,600	..	3	31	59	1	6	2,400	Rigor at 8 p.m.
24-3-30	11-50 a.m.	98°F.	5,440	..	3	90	1	1	5	280	
25-3-30	11-40 a.m.	98°F.	10,400	..	..	11	83	..	6	600	Rigor that evening at 7-30 p.m. Many of the rings are so minute as to be almost still in the merozoite stage. (No free merozoites seen.)
26-3-30	11-30 a.m.	100°F.	10,120	..	74	20	1	..	5	480	
27-3-30	10-35 a.m.	98.6°F.	8,160	..	8	87	2	..	3	240	
28-3-30	4-15 p.m.	100°F.	8,550	..	2	23	67	4	4	300	Rigor at 9-30 p.m.
29-3-30	10-40 a.m.	100.6°F.	960	..	42	29	17	8	4	40	2 a.m. Quinine 10 grains in solution.
31-3-30	10-45 a.m.	98°F.	520	..	15	62	23	..	..	0	After 20 grains of quinine.
1-4-30	11-55 a.m.	97°F.	160	..	..	75	25	..	..	0	After 40 grains of quinine.
2-4-30	11 a.m.	97°F.	80	..	..	50	50	..	..	0	After 60 grains of quinine.
3-4-30	11-25 a.m.	97°F.	40	..	..	..	..	100	..	40	After 80 grains of quinine.
4-4-30	12 midday	97°F.	40	..	..	..	100	..	..	0	After 100 grains of quinine.
5-4-30	11 a.m.	98°F.	0	..	..	..	..	..	..	0	Thin and thick films negative. After 120 grains of quinine.
9-4-30	11-30 a.m.	98.4°F.	0	..	..	..	..	..	..	..	Bass culture negative. After 200 grains of quinine in solution.
30-4-30	..	..	0	..	..	..	..	..	..	..	Bass culture negative 16 days after cessation of quinine treatment.

CHART 2.



was an enormous destruction of parasites going on in this patient's blood. At 4 p.m. on March 6th the count was 320 per c.mm., and this was followed by a rigor the same evening. Assuming that each schizont gives rise to about 8 merozoites, this should have led to a parasite population of about 2,560 per c.mm. the next day; whereas the actual count was only 1,640 per c.mm.

The count at 10-30 a.m. on March 19th is of special interest in this connection. The film showed no less than 92 per cent. of mature rosettes or free merozoites, and a rigor occurred half an hour after it was taken. The number of merozoites present was 117,000 per c.mm. of blood. Were no merozoites to undergo destruction, this should have led to 117,000 growing trophozoites the next day. The actual count the next day, however, was 5,840 parasites per c.mm.

In other words at this schizogony cycle 117,000—5,840 merozoites per c.mm. were destroyed on rupture of the mature rosettes; or 111,160 merozoites per c.mm. This represents 111,160/117,000ths of the infection, or 95 per cent. of the parasite population present. Although the malaria infection was at this stage a gradually progressive one and the patient was very ill, yet his natural powers of resistance were such that his system could kill off 95 per cent. of the parasite population at each schizogony cycle. In cases of malaria undergoing spontaneous cure or resolution, the percentage destruction of parasites must be at an even higher level. If it were not for this natural resistance to malaria, there would be no population left in the tropics.

What is the exact mechanism of this destruction of parasites? The counts in Table I suggest that it is only during the free merozoite stage that parasites are destroyed. Once they enter within the red corpuscles they are safe until the next schizogony cycle matures; and consequently the counts in the intervals between the rigors for one and the same schizogony cycle tend to remain at about the same level.

In culture the destruction of parasites is confined to the free merozoite stage, and takes place by phagocytosis by the polymorphonuclear leucocytes. We were not aware of this until we saw Thomson and Robertson's recently published *Protozoology, a Manual for Medical Men*. In Plate III of that book, fig. 24, there is shown a polymorphonuclear leucocyte containing the merozoites and hæmozoin pigment of two rosettes of *P. falciparum*. Fig. 1 is a reproduction of this sketch by Thomson and Robertson in black and white.

When we first saw this sketch, we were frankly incredulous. The authors do not mention from what source it is taken, but we presume that it must be from a culture. Subsequently, however, we have often seen the same phenomenon in cultures. It can be observed readily by taking films from the culture at

the moment when the majority of rosettes are bursting and liberating their merozoites.

We have never seen the same phenomenon in blood films from man, however, and we very much doubt whether phagocytosis of the merozoites occurs in man. We have shown the



Fig. 1.—Polymorphonuclear leucocyte containing two malignant tertian schizonts.  
(After Thomson and Robertson, 1929. *Protozoology*, Plate III, fig. 24.)

sketch by Thomson and Robertson to most of the well known malariologists of India, and to the members of the Malaria Commission of the League of Nations when they visited Calcutta last October, and none of them had ever seen this phenomenon in blood films from man. Of course it is well known that when the rosettes burst, the liberated hæmozoin is engulfed by the large hyaline mononuclear leucocytes, and carried by them to the internal viscera, but, as far as one knows, no author has suggested that merozoites are ingested by the leucocytes of any type. D. Thomson (1914) has a sketch showing ingestion of merozoites by endothelial cells of the spleen, the material having been obtained at a post-mortem examination. On the other hand Knowles, Acton and Das Gupta (1923), in a series of spleen punctures carried out on patients with chronic and relapsing malaria, failed to find any evidence of phagocytosis, either by leucocytes or by the endothelial cells; what was present were parasites in all stages of lysis and dissolution, the chromatin undergoing karyolysis and karyorrhexis, and the cytoplasm becoming progressively more and more vacuolated, until finally the parasites disintegrated, leaving behind nothing but free hæmozoin. (The colour plate with which it had been intended to illustrate that paper of 1923 was unfortunately lost; but the findings present all pointed to lysis of the parasites, rather than to phagocytosis.)

The exact mechanism of parasite destruction requires much more study than it has received hitherto in the malaria literature. Tentatively we would suggest that such destruction only takes place during the free merozoite stage; that it is probably due to the production of lysins in the plasma, though possibly phagocytosis by the endothelial cells may also play a part.

3. *The Fever of First Invasion in Quartan Malaria* appears to be a rather irregular one. It shows a tendency towards quartan periodicity, but is much more irregular than is the



periodicity when the infection is well established.

We have every reason to believe that this was the first attack of quartan malaria from which this patient had ever suffered. The patient is a resident of Muzafferpore, and had only come to Calcutta a month and a half before his admission to hospital. It is not likely that he could have contracted quartan malaria in the former station, for the general incidence of quartan malaria in the United Provinces is only 3.9 per cent. of the malaria present.\* He stated that he had been free from fever during the previous ten years, and he was completely afebrile during the first 36 days of his stay in hospital before the onset of the induced fever.

Further, the Bass cultures of January 23rd and February 15th both gave negative results. Of course one cannot absolutely exclude previous malaria infection in any patient residing in the plains of India, but we have every reason to believe that this patient had never previously suffered from quartan malaria.

We may take the rigor at 6 p.m. on March 6th as the starting point, so to speak, of one schizogony cycle, as the film taken at 4 p.m. that afternoon showed nothing but maturing schizonts. Then—

Rigors should have occurred on March.	Rigors actually occurred on March.	Interval in hours.
6th	6th	0
9th	9th	75
12th	12th	71
15th	13th	24
18th	16th	70
21st	18th	65
24th	22nd	81
27th	25th	71½
30th	28th	74

Now James (1926, 1926a) has drawn attention to the difference between primary benign tertian malaria, as induced in mental patients by bites of infected anophelines, and relapsing benign tertian malaria or re-infection. In primary benign tertian malaria in persons who have never had malaria before, the incubation period after the mosquito bite was from 7 to 23 days, and the patient then developed the fever of the "initial stage" which lasted from 2 to 5 days. This is at first a gradually increasing fever, at first sub-continuous or irregularly remittent, but towards the end of this stage always intermittent. There are no rigors during this period, and its termination is sometimes shown by an intermission lasting 24 or 48 hours. The initial stage is followed by the developed stage; in 80 to 90 per cent. of cases this is not a fever of tertian periodicity, but a fever of quotidian periodicity with a daily rigor. This lasts for ten days or longer. It is followed by the terminal stage. In this the type of fever again changes, and becomes the

typical benign tertian fever of the textbooks with tertian periodicity and a rigor every 48 hours. At a future date, should the patient have a relapse or a re-infection, the initial stage and the stage of daily rigors are not shown; the fever is a typically tertian one. James explains this phenomenon of the initial stage and the daily rigors by a lag in development of some of the parasites.

A study of Charts 1 and 2 shows a somewhat similar trend. The fever at first tends to be irregular, and rigors occurred at an interval of only 24 hours. Later, as the fever became more established, so to speak, the temperature chart and the counts showed a much more marked quartan periodicity.

The correlation between the counts and the temperature chart is much less exact than might have been expected (Chart 2), but this is perhaps because the counts were not carried out frequently enough. The absence of counts on the three Sundays in March is unfortunate, and it is clear that in future studies on such cases counts will have to be taken with due regard to the temperature chart. The correlation of high counts with the approaching rigor, however, is well seen in the counts of March 19th, 22nd, and 25th.

#### 4. Notes on the Schizogony Cycle of Plasmodium malariae.

A study of the relative percentages columns in Table I shows many features of interest.

Free merozoites were only encountered within half an hour of the rigor, and it would appear that the free merozoite stage only lasts for a very short period—probably not for more than an hour or two.

The duration of the ring form, with the vacuole still in evidence, is not very prolonged. It will be seen that rings were a prominent feature of the counts on—

March 10th at 13½ hours after the rigor.

March 20th at 24½ hours after the rigor.

March 26th at 16 hours after the rigor.

March 29th at 13½ hours after the rigor.

Far and away the commonest phase of the parasite encountered is the growing trophozoite phase before schizogony sets in, and of these forms (in this particular instance) the "equatorial band" forms were much the commonest encountered. These forms are very characteristic of *P. malariae* infections.

As a rule schizogony does not commence until the growing trophozoite almost fills the infected red corpuscle, though occasionally it may set in in a growing equatorial band form, which fills about half the red corpuscle. Schizonts were a prominent feature of the films taken on—

March 6th at 2 hours before the rigor.

March 12th at 5 hours before the rigor.

March 13th at 9 hours before the rigor.

March 22nd at 7 hours before the rigor.

March 25th at 9 hours before the rigor.

March 28th at 5½ hours before the rigor.

\* Knowles and Senior-White. "Studies in the Parasitology of Malaria." (In Press.)

Mature rosettes, showing well differentiated merozoites, were only prominent in one film, the count on March 19th, half an hour prior to the rigor.

From these findings it is possible to work out a rough "time table" of the schizogony cycle of *P. malariae* as follows:—

Phase.	Duration in hours.	
Free merozoite	..	1
Ring phase	..	17
Growing trophozoite	..	47
Schizont	..	6
Mature rosette	..	1

With regard to mature rosettes, in which all the merozoites had become clearly differentiated, but where rupture of the rosette had not yet taken place, we encountered in all 70 of these forms—most of them in the films taken on March 19th. Their distribution with regard to the number of merozoites present was as follows:—

6 merozoites were present in each of 3 rosettes.

7 merozoites were present in each of 13 rosettes.

8 merozoites were present in each of 29 rosettes.

9 merozoites were present in each of 21 rosettes.

10 merozoites were present each in 4 rosettes.

Thus the number of merozoites produced by *P. malariae* is very constant and shows but little variation. The mean of the above figures works out at 8.1.

Owing to the extremely heavy character of the infection in this patient, we had the opportunity of seeing certain appearances that we had never previously seen in infections with *P. malariae*. Thus accolé rings were not uncommon—a finding which never occurs in light infections with this species. Also dual infection of the same erythrocyte was seen three times, the findings being—

Ring plus ring once.

Trophozoite plus trophozoite once.

Macrogametocyte plus macrogametocyte once.

We had never previously seen dual infection of the erythrocyte in infections with *P. malariae*.

5. *Gametocytes*.—Gametocytes were encountered in 20 out of the 27 counts carried out; and constituted 184 out of 2,984 parasites met with, or 6.2 per cent. Males were to females as 82:102 or 1:1.2. (For the definition of what we believe to be the male and female gametocytes of *P. malariae* we may refer the reader to Knowles' *Introduction to Medical Protozoology*, 1928, pp. 391, 392.) Females outnumbered males on 8 occasions; males outnumbered females on 6 occasions; and on 6 occasions the numbers were equal.

On a study of Chart 2 it will be seen that there is a fairly close correlation between the

total parasite count and the gametocyte count, both tending to rise and fall together—though the gametocyte wave tends to follow the curve for total parasites some hours later. This would appear to indicate that the mature gametocytes are formed from some of the merozoites liberated at the previous schizogony cycle, but that they take a few more hours to mature than do the mature schizont rosettes. To some extent gametocyte production appears to fluctuate in a wave-like manner. Thus a first wave of production reached its peak on March 8th, and thereafter declined to zero on March 14th, although the total parasite count remained in the neighbourhood of 6,000 per c.mm. This was followed by a second wave which reached a peak on March 22nd, and thereafter declined, although the total parasite count remained in the neighbourhood of 8,000 to 10,000 per c.mm. Gametocytes disappeared very rapidly after quinine administration, and these forms appear to be equally susceptible to destruction by quinine as do the asexual forms.

One interesting point remains to be recorded, however. In the blood films taken on March 4th, before the counts were commenced, and two days before the patient's first rigor, scanty gametocytes were present. These could hardly have been derived from pre-gametocyte forms injected with the donor's blood on the 17th February, for the whole of the evidence in Table I and Chart 2 goes to show that the gametocytes are relatively short-lived forms. Thus it will be seen that a gametocyte count of 1,800 per c.mm. on March 8th fell to zero by March 14th, and one of 2,400 on March 22nd fell to 280 per c.mm. within 24 hours. We doubt whether the duration of life of a mature gametocyte of *P. malariae*, which is not ingested by an anopheline mosquito, and continues to be present in the circulating blood, exceeds six days. It seems reasonably certain that the gametocytes seen on March 4th were derived from merozoites liberated into the patient's plasma at the previous schizogony cycle, at a time when the infection was still at a sub-febrile level. In this case it has to be realised that gametocytes may appear at the earliest phases of an infection with *P. malariae*. It will be seen that gametocytes were still present in the blood of the second patient whose case is quoted in this paper, after a chronic infection with *P. malariae* of more than five months' duration. Gametocyte production therefore appears to be continuous throughout the whole course of an infection with *P. malariae*.

6. *Quinine*.—The Bass culture of April 9th was negative. This was after the administration of 200 grains of quinine sulphate in solution in ten days. No shorter course of quinine therapy (without alkalies) would seem to be efficacious in sterilizing the patient of his parasites.

### Conclusions.

1. Quartan malaria may be a very severe disease, associated with very high parasite counts. On the other hand in chronic and relapsing cases of long standing the counts are very low.

2. Even in a case of quartan malaria which is of progressive character, some 95 per cent. of the merozoites are destroyed at each schizogony cycle by the natural powers of resistance of the body. We believe that the mechanism of this destruction of parasites is by the production of lysins in the plasma (possibly assisted by phagocytosis of merozoites by the endothelial cells of the internal viscera).

3. In primary quartan malaria the fever of invasion tends to be somewhat irregular; it is only as the infection becomes well established that typical quartan periodicity is attained.

4. In the schizogony cycle of *P. malariae* the free merozoite stage only lasts about 1 hour; the ring stage some 17 hours; the growing trophozoite stage 47 hours; the stage of schizogony some 6 hours; and the mature rosette stage about 1 hour. The number of merozoites produced is very constant; about 8 in the majority of rosettes.

5. In heavy infections with *P. malariae* accolé rings are encountered, and also double infection of the same erythrocyte with two parasites.

6. Gametocytes constitute some 6.2 per cent. of the total parasite population of *P. malariae*. The curve of gametocyte production appears to follow that of the schizogony cycle, but at a period some hours later. The gametocytes do not have a life of much more than six days. They are rapidly destroyed by quinine treatment. Gametocytes may appear in an infection with *P. malariae* at the very commencement of the fever.

7. A course of 200 grains of quinine sulphate (without alkalis) in ten days appeared to have completely eradicated the infection.

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### ENTEROCOCCUS BACTERIÆMIA IN ASSOCIATION WITH INFECTIONS WITH *BACILLUS TYPHOSUS*.

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At the outset we wish to state that the organisms to which we refer as enterococci are those conforming to the description given by Besson(1), who states that "the enterococcus of Thiercelin(2) is a saprophytic microbe susceptible of becoming pathogenic; it is encountered in man in the gastro-intestinal tract and elsewhere. Becoming virulent it may cause affections of the digestive tube, and is capable of invading the organism and of determining septicæmias and localising in other situations."

When beginning the observations here recorded we were employing the term "*Streptococcus faecalis*," having adopted Holman's(3) classification of the group. As our studies progressed, for reasons which we shall record in a later paper, when we consider in detail the characters of the organisms observed, and in order that confusion with the more typical streptococci might not occur, we adopted the name enterococcus, having concluded with Dible(4),

and Besson, that this term might be reserved for them and that its use was justifiable.

During the past few years our attention at the Medical College has been directed to the study of the faecal flora and especially to the "stool cocci."

In connection with these investigations we have been interested in a series of cases of fever, most of them due to infection with *B. typhosus*, in which we have secured the enterococcus in cultures of the blood, either coincidentally with the former organism, or alone.

We have gone through most of the literature available locally without having encountered any descriptions of similar findings, although numerous cases have been recorded, singly or in series, in which enterococcus bacteriæmia has been observed, of which the following are examples:—

(a) Andrewes and Horder(5) in their articles mention recovering it in four cases of septicæmia: two of meningitis, once in association with a parametritic abscess, and once with acute otitis media, and also in four cases of malignant endocarditis.

(b) In French literature as cited by Besson(1) there have been recorded cases of infectious endocarditis, due to the enterococcus,

and he further states that this micro-organism may give rise to septicæmia, either secondary to another infection, or primarily.

(c) Among such cases may be mentioned that reported by Rouslacroix, Zuccoli and P. Martin(6) in which the enterococcus was secured in a case of malignant endocarditis with septicæmia. As a matter of fact the French group the various manifestations of pathogenicity on the part of the enterococcus under the heading "enterococcie."

(d) During the war Houston and McCloy(7) secured the enterococcus in blood cultures from a number of cases which they classified on clinical grounds into three divisions:—(a) septicæmia, (b) 'trench fever,' and (c) myalgia groups. Their cases in general had relatively mild febrile courses, no fatal results were recorded, and none were associated with enteric infections.

(e) Donaldson(8) refers to the recovery of the enterococcus from the uterus in a single case of puerperal septicæmia.

During the past five years we have secured the enterococcus in blood cultures from several patients in the wards of the Medical College Hospital. The chief features of this series of cases are indicated in Table I.

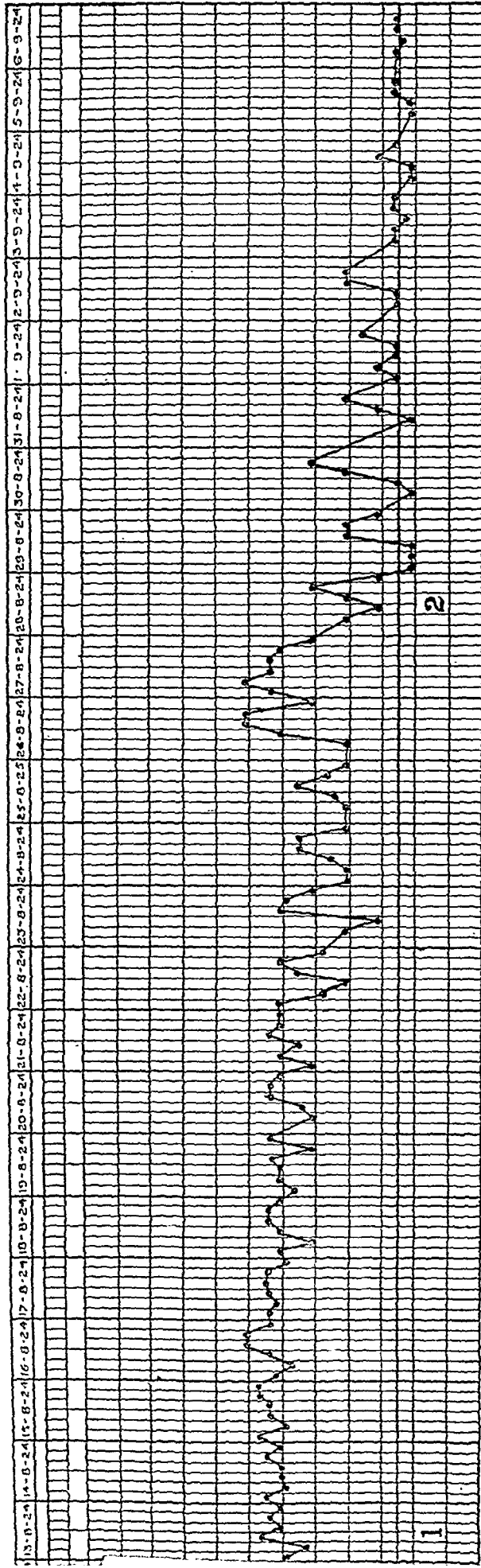
TABLE I.

No.	Patient.	Day of disease or dates.	Result of culture of blood.	Result of agglutination reaction.	REMARKS.
1	Indian male. Age 7.	28th day of disease.	<i>B. typhosus</i> and enterococcus together.	Positive with <i>B. typhosus</i> to 1 in 250, end point not observed.	Continued fever of enteric type. Patient recovered.
2	Indian male ..	15th day of disease.	Sterile .. ..	Positive with <i>B. typhosus</i> to 1 in 83.	Temperature Chart 1.
		30th day of disease.	Enterococcus alone ..	Positive with <i>B. typhosus</i> to 1 in 500.	Continued fever of enteric type. Patient recovered.
3	European female. Age 12.	27-8-24 ..	Sterile .. ..	Positive with <i>B. typhosus</i> to 1 in 70.	
		9-9-24 ..	<i>B. typhosus</i> ..	....	
		17-9-24 ..	....	....	Pus in urine, culture gave <i>B. coli</i> . Patient died.
4	Indian child ..	2-10-24 ..	Enterococcus alone ..	....	
		....	Enterococcus alone ..	Positive with <i>B. typhosus</i> to 1 in 250.	
		....	....	....	Fæces culture, <i>B. typhosus</i> present.
5	European female adult.	....	Enterococcus alone ..	Positive with <i>B. typhosus</i> to 1 in 83.	
6	European child	....	Enterococcus alone ..	Positive with <i>B. typhosus</i> to 1 in 83.	
7	European male adult.	....	<i>B. typhosus</i> and enterococcus together.	Positive with <i>B. typhosus</i> to 1 in 250.	
8	European male adult.	15-6-25 ..	Enterococcus alone ..	Negative with organisms of the typhoid, paratyphoid group.	
9	Indian male adult.	22-6-25 ..	Enterococcus alone ....	Positive with <i>B. typhosus</i> to 1 in 250.	
10	Indian male adult.	9-7-25 ..	Enterococcus alone ..	Positive with <i>B. typhosus</i> to 1 in 250.	Urine on culture gave a growth of <i>B. typhosus</i> and enterococcus.

TABLE I—contd.

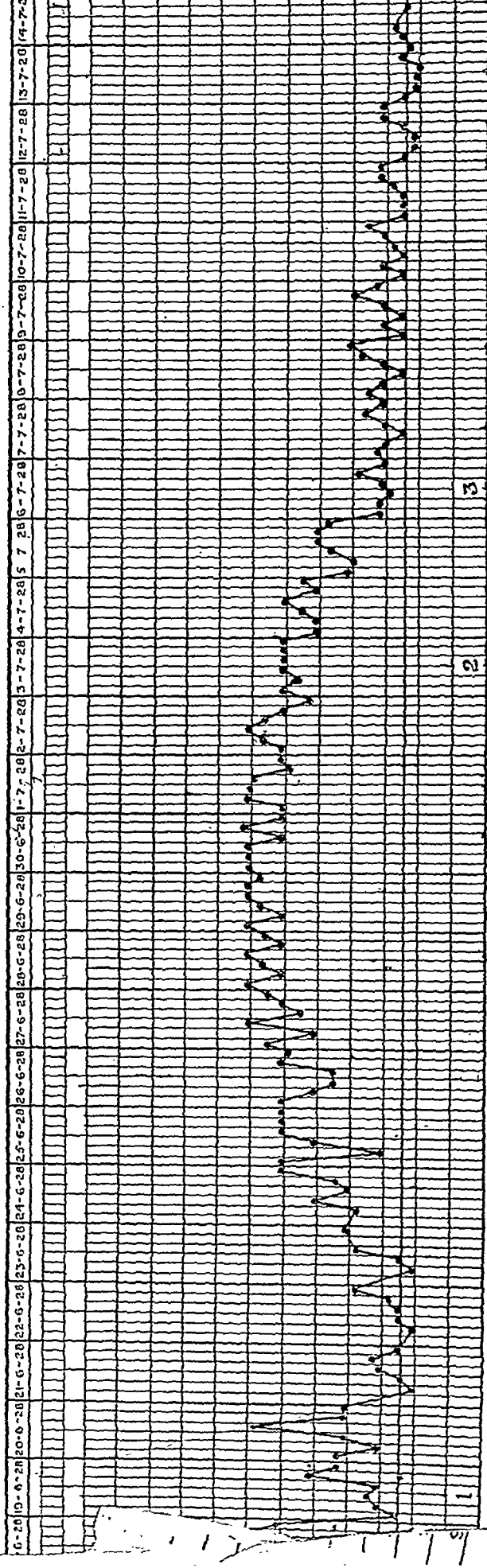
No.	Patient.	Day of disease or dates.	Result of culture of blood.	Result of agglutination reaction.	REMARKS.
11	European female. Age 8.	12-4-27 ..	Enterococcus alone ..	Negative with organisms of the typhoid, paratyphoid group.	Ten days' fever before admission. Temperature normal from 12th day of disease. Five days in hospital. Urine on culture gave a growth of <i>B. typhosus</i> and <i>B. coli</i> .
12	European female.	11th day of disease.	Sterile .. ..	Positive with <i>B. typhosus</i> to 1 in 500.	Second culture of blood made during relapse of five days' duration.
		21th day of disease.	<i>B. typhosus</i> and enterococcus together.	Positive with <i>B. typhosus</i> to 1 in 500.	
13	Indian male. Age 10.	22-5-28. 11th day of disease.	Contaminated ..	Positive with <i>B. typhosus</i> to 1 in 500.	Approximately the 11th day of disease in a typical attack of typhoid fever clinically.
		18th day of disease.	Enterococcus ..	Positive with <i>B. typhosus</i> to 1 in 2,500.	
		21st day of disease.	....	Positive with <i>B. typhosus</i> to 1 in 2,500.	
14	European female adult. Age 36.	19th day of disease.	<i>B. typhosus</i> alone ..	Negative with organisms of the typhoid, paratyphoid group.	No complications. Patient recovered. Temperature Chart 2.
		23rd day of disease.	Enterococcus alone ..	....	
		26th day of disease.	....	Positive with <i>B. typhosus</i> to 1 in 500.	
15	Indian male adult. Age 20.	14th day of disease.	<i>B. typhosus</i> and enterococcus together.	Result unsatisfactory on account of hæmolysis of blood.	Typical attack clinically with remittent temperature ranging from 101° to 103.5°F.
		19th day of disease.	....	Positive with <i>B. typhosus</i> to 1 in 500.	
16	European female adult.	14th day of disease.	Enterococcus alone ...	Positive with <i>B. typhosus</i> to 1 in 50.	Leucocyte count 19,500 per c.mm. (82% neutrophils). Faeces, showing mucus and cells on culture gave <i>B. typhosus</i> with enterococcus of which the latter constituted 70% of the colonies. Leucocyte count 19,000 per c.mm. (80% neutrophils). Fever continued for 48 days.
		31st day of disease.	....	....	
17	Indian male ..	14th day of disease.	<i>B. typhosus</i> and enterococcus together.	Positive with <i>B. typhosus</i> to 1 in 83.	Clinically a typical typhoid infection.
18	Male, aged 18 ..	18th day of disease.	....	Positive with <i>B. typhosus</i> to 1 in 250.	Date 1-1-30. No. 227-30. Culture of faeces gives <i>B. typhosus</i> . 31-1-30. No. 327-30 with 80% of colonies enterococci. 5-2-30. No. 402-30.
		49th day of disease.	....	....	
		54th day of disease.	<i>B. typhosus</i> and enterococcus together.	....	
		61st day of disease.	....	....	
		66th day of disease.	<i>B. typhosus</i> ..	....	Culture of urine gives <i>B. typhosus</i> . 12-2-30. No. 481-30. Fever continuous throughout without any intermissions.

TEMPERATURE CHART 1.



1 = First examination of blood. 2 = Second examination of blood.

TEMPERATURE CHART 2.



1 = First examination of blood. 2 = Second examination of blood. 3 = Third examination of blood.





TABLE I—concl'd.

No.	Patient.	Day of disease or dates.	Result of culture of blood.	Result of agglutination reaction.	REMARKS.
19	European male. Age 19.	Admitted 27-3-30. 29-3-30 (10th day of disease). 31-3-30 (12th day of disease). 2-4-30 (14th day of disease). 13-4-30 (25th day of disease). 25-4-30 (37th day of disease). 9-5-30 (48th day of disease).	.... .... .... .... Enterococcus alone .. ....	Negative with organisms of the typhoid and paratyphoid group. .... Negative with organisms of the typhoid and paratyphoid group. Positive with <i>B. typhosus</i> to 1 in 83. .... Positive with <i>B. typhosus</i> to 1 in 125.	<i>B. typhosus</i> in culture of faeces.  The temperature was at a level about normal from the 25th day of disease until the 35th, when an exacerbation to 103° occurred lasting three days. Clinically a typical typhoid infection.

As far as the characters of these organisms are concerned, they have generally, when first isolated, shown short chain formation—four to eight elements in line—and, on subculture, diplococcal forms.

None have been hæmolytic, but most have produced a slight green or greyish green tint on blood agar.

The earlier strains secured from the blood gave acid reactions when grown in lactose, mannite, and salicin (Holman)—Table II.

As our studies have progressed, we have been using more elaborate methods of identification as indicated by Schönfeld (9), Meyer and v. Schönfeld (10), Meyer (11), and Weatherall and Dible (12)—Table III.

TABLE II.

Case No.	Morphology.	Blood-agar.	Broth.	Lactose.	Mannite.	Salicin.
1	Short chains and diplococci.	Greenish gray	Uniformly turbid.	+	+	+
2	Do.	..	..	+	+	+
3	Do.	..	..	+	+	+
4	Do.	..	..	+	+	+
5	Do.	..	..	+	+	+
6	Do.	..	..	+	+	+
7	Do.	..	..	+	+	+
8	Do.	..	..	+	+	+
9	Do.	..	..	+	+	+
10	Do.	..	..	+	+	+
11	Do.	..	..	+	+	+

TABLE III.

Case No.	Morphology.	Blood-agar.	Broth.	Lactose.	Mannite.	Salicin.	Aeskulin.	Raffinose.	Thermo-resistance.
12	Diplococci few short chains some show capsules.	Grayish green.	Uniformly turbid.	+	+	+	+	—	Not estimated.
13	Diplococci lance shaped some showing capsules.	Grayish. No hæmolysis.	Do.	+	+	+	+	—	Do.
14	Diplococci lance shaped.	No greening.	Do.	+	+	+	+	—	+
15	Do.	Distinct greening.	Do.	+	+	+	+	+	+
16	Diplococci few short chains.	Grayish green.	Do.	+	+	+	Not set up.	Not set up.	Not estimated.

TABLE III—concl'd.

Case No.	Morphology.	Broth.	Lactose.	Mannite.	Salicin.	Aeskulin.	Raffinose.	Thermo-resistance.	Inulin.
17	Lance shaped diplococci.	Uniformly turbid.	+	+	+	+	—	+	Not set up.
18	Diplococci ovoid coarse.	Do.	+	+	+	+	Not set up.	+	+
19	Lance shaped diplococci.	Do.	+	+	+	+	Do.	+	+

+ = acid.

Thermo-resistance + = 30 minutes at 60°C.

An analysis of these characters is being carried on by us at present in connection with our investigations of the occurrence and nature of faecal cocci in cases of dysentery and colitis.

In connection with the cases of which the features are outlined in Table I, the chief observation is that, in the majority of them the enterococcus was obtained in culture of the blood during the course of an infection with the typhoid bacillus.

Case No. 8 is an exception in that no bacteriological evidence was secured indicating enteric fever.

The laboratory evidence in three cases, Nos. 5, 6 and 9, rests on the agglutination reaction alone. Clinically, however, these were of the enteric type.

The only fatal termination occurred in Case No. 3, to which various factors, other than the enterococcus, would seem to have contributed.

In all cases the finding of the enterococcus in cultures of the blood in the later stages of the disease, was obtained during slight febrile exacerbations.

#### Summary.

A series of observations are recorded in which an enterococcus bacteriæmia occurred as a complication of typhoid fever.

From these observations it seems justifiable to conclude that the enterococcus was a temporary, and relatively innocuous, invader of the blood stream.

We have not observed in any case the occurrence of a true streptococcus septicæmia associated with a typhoid infection.

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#### INFECTION BY A GNATHOSTOME SIMULATING MASTOIDITIS.

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(From the Department of Surgery, Carmichael Medical College, Calcutta.)

The patient, a Hindu female, æt. twenty years, of Howrah, who had never been out of Bengal, was admitted to hospital on the 5th August 1929.

*Previous history.*—About two months before the above date the patient had a sore throat followed by a pain in the right ear. The next day there was a discharge of blood from the ear and the pain subsided. During treatment before coming to hospital three thread-like structures came away from the right ear. They were not specially examined, but were identified by naked eye examination as possibly blood clots.

*On admission.*—The patient complained of severe earache, and she had a discharge of blood from the right ear, which had been present for the past fifteen days. A swelling appeared two days before coming to hospital, which at first involved the right mastoid, temporal, and preauricular regions, it had now spread until both eyelids of the right eye were involved. There was no impairment of hearing, and the ear drum was intact, but congested.

Blood examination revealed nothing characteristic, the count was as follows:—

Hæmoglobin	..	..	42%
R.B.C.	..	..	2,100,000
W.B.C.	..	..	6,250
Polymorphs.	..	..	55%
Small Lymph.	..	..	30%
Large Lymph.	..	..	10%
Eosinophil.	..	..	5%

A provisional diagnosis of mastoiditis was made, and three days after admission the

swelling had considerably subsided. Under chloroform anaesthesia the usual mastoid incision was made, and on exposing the bone a small worm-like body was seen at the upper end of the incision on the deep surface of the temporal muscle. This was removed and it was found to be a living worm. Mastoidectomy was not carried out as the bone appeared healthy. Ten days after the operation the patient was discharged with no further symptoms and with the wound almost healed. Up to the time of writing this note, nearly six months after the operation, the patient has been quite free from any ear symptoms, or other evidence of disease in the region previously affected.

My thanks are due to Dr. Mrigendralal Mitra for permission to operate on the case and to publish this note.

#### THE PARASITE.

By P. A. MAPLESTONE, D.S.O., M.B., CH.B., D.T.M.

(From the Hookworm Research Laboratory, Calcutta School of Tropical Medicine and Hygiene.)

THE worm removed from the above case was handed to me for identification.

It is a typical male *Gnathostome*. The length is 15.1 mm. and the maximum diameter, which is a little behind the middle of its length, is 1.4 mm. The diameter of the head bulb is 0.574 mm. and its length is 0.257 mm. There are eight rows of single pointed spines on the head bulb, quite typical in their appearance. The body is covered anteriorly with the usual broad spines with three to five points, these give place to finer single pointed spines which finally disappear at a distance of 6.5 mm. from the anterior end. The four cervical sacs end 1.68 to 1.98 mm. from the anterior end, and the oesophagus is 3.6 mm. in length. The posterior extremity is furnished with four large papillae on each side and its ventral surface is covered with fine closely set spines. The spicules are 1.16 and 0.6 mm. in length respectively.

There is little doubt that this parasite is a specimen of *Gnathostoma spinigerum* Owen, 1836 [or preferably *G. robustum* (Diesing, 1838)]. It is similar to *G. spinigerum* (Leiper, 1911) and *G. spinigerum* (Levinsen, 1889), but comparison of the dimensions given by Levinsen and Leiper with those of the present specimen indicate that it is more mature than either of the above worms. Indeed the measurements given for the adult male of *G. spinigerum* are in some instances smaller than those in the present example, it is therefore probable that this worm is fully grown.

**Discussion.**—This case is of interest for two reasons. In the first place human infection by *Gnathostoma* was not known to occur in India before the record of a case by the writer only last November, and the second point of interest is that the effects produced by this worm

suggested such a serious condition as mastoiditis.

The history and bibliography of human infection with *Gnathostomes* has been given so recently by the writer (*Indian Medical Gazette*, November 1929, Vol. 64, p. 274) that it is not proposed to repeat it here, and the reader is referred to the above article.

This case makes the twelfth on record, and it is interesting to note that of the four cases in which the sex has been determined they have all been males. Another interesting fact is that the worms have been found in various stages of development, from quite immature larvæ up to the specimen in the present instance, which is apparently a fully grown worm. This raises the question as to whether these worms are capable of entering the body at different stages of their life history, or whether, having gained entrance to the human host as larvæ, they are able to undergo development to apparent maturity in the tissues.

#### ON THE RELATIVE FREQUENCY OF SUPRACLAVICULAR AND INFRACLAVICULAR PULMONARY TUBERCULOSIS, AND ITS BEARING ON THE PROGNOSIS OF THE DISEASE IN INDIA.\*

By M. KESAVA PAI, M.D.,  
and

K. VASUDEVA RAO, M.D.

(From the Tuberculosis Hospital, Madras.)

IN the diagnosis of early pulmonary tuberculosis by physical signs, it has been taken as a clinical dogma that signs observed at the apex, i.e., in the first intercostal space and above should, as a rule, be considered to be due to tuberculous disease, whilst signs lower down with nothing abnormal above the second rib in front should be looked upon as non-tuberculous in nature.

With the introduction of the Roentgen rays and their application to the diagnosis of pulmonary tuberculosis, our ideas of the pathology of tuberculosis of the lungs have undergone a considerable change. The comparative freedom from opacity of the hilum of the lung in the infant, the increase in the area and depth of this opacity in the growing child and adult, the frequent presence of opaque calcareous masses in the region of the hilum and the adjoining lung substance, the post-mortem findings of healing and healed lesions, especially at the root of the lungs and in the mediastinal glands of clinically non-tuberculous individuals dying from other causes, and the observations made in all modern countries on the incidence of allergy increasing rapidly from infancy to adult life in apparently normal individuals, as indicated by the cutaneous reaction of Von

\* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad, January 1930.

Pirquet, have gradually led the pathologist to a change in his views as regards the origin and course of the disease in the lungs.

It is a common observation made by the roentgenologist and the pathologist, that there is a large number of cases where signs of tuberculous deposit are evident in the region of the hilum glands and the lung substance surrounding it, without any signs of implication of the apex, and a close study of serial roentgenograms of a large number of cases of early and suspected pulmonary tuberculosis has revealed the presence of tuberculous extensions from the region of the hilum into the periphery of the lung more frequently in an upward and outward direction than towards the base, without any involvement of the actual apex. This has been explained to be due to extension of infection along the lymphatic channels connecting the central lymphatic glands in the mediastinum with the lymphoid tissue in the periphery of the lung, the anastomotic channels between the mediastinal glands, the lymphoid tissue at the apex, and the supraclavicular lymphatics being considered to be the most patent and free of all, causing a predominance in the extensions towards the apex.

In the pre-Roentgen days when the localization of tuberculous disease in the lungs had to be made by physical examination alone, which could not as a rule reveal disease at the hilum, the first signs were, for obvious reasons, noticed mostly at the apex, but with the introduction of X-ray diagnosis and the confirmation of physical diagnosis with the skiagram, it has become increasingly evident that a large number of active cases of pulmonary tuberculosis show the initial lesion below the apex, which remains free up to a comparatively late stage of the disease. Thus Fishberg(1) at the last annual meeting of the British Medical Association at Manchester laid great emphasis on what he called the subapical or subclavicular localization of tuberculous lesions in the lungs, predominating over the true apical.

William Ewart(2) and Kingston Fowler(3) in England, Fishberg and others in America, and a number of pathological anatomists on the continent have similarly described that the early lesions, as well as the cavities resulting from their break-down, are much more frequent at a distance lower down in the first and second intercostal spaces than at the apex, and Fishberg(1), by a study of the clinical history of a large number of such cases, considered that the subclavicular type of case was more acute and more virulent than the true apical cases.

The diagnosis of apical tuberculosis by physical examination alone without confirmation by the X-rays is by no means free from error. A comparative study of a larger number of cases by physical signs and by roentgenology has made it sufficiently evident that the presence of such physical signs as harsh breath

sounds, broncho-vesicular breath sounds, and even occasionally bronchial murmurs at the apex is not at all inconsistent with an apex free from disease, the causation of such abnormal breath sounds being apparently due to hilum disease or to density of tissue by deposit, fibrosis, etc., in the upper lobe between the root of the lung and the apex. It is thus evident that the diagnosis of the pathological condition by physical examination alone cannot be considered to be accurate or reliable.

In the investigation which forms the subject of this paper we have therefore relied more upon the X-ray appearances of the lungs than on the results of physical examination. It must however be mentioned that with the exception of a comparatively small proportion of cases the results of physical examination have closely agreed with the X-ray findings.

The cases constituting our series can, for purposes of pathological classification, be divided into six groups:

1. Cases of extensive implication of the lungs, including the apex, in which it was not possible to locate the original focus with certainty.
2. Cases where the lesion could be localized in the infraclavicular region, i.e., in the first or second intercostal spaces.
3. Cases in which the lesion was in the middle zone of the lung, with the rest of the lung parenchyma in a healthy condition.
3. Cases in which the lower zone of the lung was the seat of tuberculous disease, with no implication of the upper two-thirds.
5. The true apical cases where the focus was at the actual apex alone, i.e., in the supraclavicular region.
6. Cases where there was evidence of implication of the hilum glands, with little or no signs of disease in the parenchyma of the lung.

A large number of the cases, viz., 240 out of 1,497, belonged to class I, evidently on account of the cases not coming for admission into hospital until they reached an advanced stage. In a large number of cases, however, it was possible, by a close scrutiny of the skiagrams to arrive at a decision as to the primary seat of the disease. Thus cases showing extensive fibrosis or a fibro-caseous involvement in the infraclavicular region, with recent infiltration and soft deposit at the apex and downwards towards the mid zone and base, could with justification, be classified as cases where the primary focus was subapical. Many of these cases showed a cavity in the first or second intercostal space, with thick fibrosed walls and situated more towards the outer aspect of the chest. Some others of this group showed very extensive and dense involvement of one lung, with a commencing focus in the subclavicular

region of the collateral lung, with the apex of the latter quite free from disease.

A very common seat of deposit in the second and third groups was the axillary aspect of the second or third intercostal space, with the rest of the parenchyma intact. Cases with fairly extensive involvement of the middle zone and a cavity in it outside the hilum were also common in the third group.

Twenty cases had involvement of the lower zone alone, with cavities in 4 cases.

The true apical cases were very few, there having been only 4 in the series.

The most common type of the incipient cases that came under treatment were the "hilum" cases, of which there were 457 in the series. These patients were admitted into the hospital for low and irregular pyrexia, bronchitis and general symptoms including loss of appetite and fatigue on exertion, with no definite signs

general condition indicates marked toxæmia, the consequent delay in the diagnosis by the majority of medical men who have no X-ray facilities at hand, and the neglect of early treatment, account in part for the worse prognosis of pulmonary tuberculosis in this country. *The duration of the disease*, as judged by the history of the cases, seems to indicate the more frequent occurrence of the acuter cases here than in Europe. Cavities have been seen in many cases that have given a history of four weeks or less since the onset of the first symptoms, and an occasional case has come into the hospital for a hæmoptysis with practically no history of previous cough, in which a skiagram has shown definite signs of a small cavity at or near the hilum or in the upper lobe.

Table I gives an idea of the incidence and the prognosis in the three stages of pulmonary

TABLE I.  
*Comparative results of treatment in different stages in England and in Southern India:*

	RESULTS IN ENGLAND.			RESULTS IN MADRAS.		
	Arrested and much improved.	Relieved.	No benefit.	Arrested and much improved.	Relieved.	No benefit.
I. Stage	90%	9%	1%	60%	34%	6%
II. Stage	81%	17%	2%	69%	18%	13%
III. Stage	45%	37%	18%	32%	34%	34%

of pulmonary tuberculosis, excepting harsh breathing at the apices or in the hilum region, or broncho-vesicular breath sounds in those areas, deficient entry of air into the apices or bases or both, and slight impairment of the percussion note over these regions. Tubercle bacilli could not as a rule be detected in the sputum of these cases. Von Pirquet's reaction gave a positive result. Skiagrams showed marked opacities at the hilum of the lungs, often with calcified deposits in and about them, peri-bronchial thickening with heavy bronchial shadows especially towards the bases, and what looked like calcified spots in the course of the linear bronchial shadows giving them an irregular beaded appearance. A certain amount of general fibrosis, marked in a few cases, as a rule, was present. No signs of soft deposit in the pulmonary parenchyma were evident.

Judging from the above figures there seems to be a marked difference in the ratio of supra-clavicular to infraclavicular lesions found in Southern India, viz., about 1 per cent. compared with those found in western countries, where they seem to constitute about 15 to 20 per cent. of all early cases.

The difficulty of locating early infraclavicular lesions by physical examination, even when the

tuberculosis in the Madras Tuberculosis Hospital, compared with the corresponding figures for England as given by Kingston Fowler(4). The difference between the Indian and English figures is very striking.

1. Whilst these are 15 to 20 per cent. of supraclavicular amongst early cases in western countries, there are much fewer of such cases in Southern India (about 1 per cent. in our series).

2. The acuteness of type and the prognosis of pulmonary tuberculosis for all ages are more unfavourable in this country than in Europe. This is indicated in Table I where it is seen that whilst 99 per cent., 98 per cent., and 82 per cent. of the cases benefit in the I, II and III stages respectively in England, the figures of the Madras Tuberculosis Hospital show a similar improvement in 93 per cent., 87 per cent., and 66 per cent. respectively. In the same table it is also seen that the figures for cases arrested and much improved are 90 per cent., 81 per cent., and 45 per cent. in England, but only 60 per cent., 69 per cent., and 32 per cent. in Madras. The fact that the Madras figure for improvement in stage II is better than that in stage I is apparently due to most of the stage II cases having been placed under artificial pneumothorax treatment.



Table II, which gives the relative incidence of primary localization, is very interesting.

TABLE II.  
*Analysis of 1,497 cases treated in the Madras Tuberculosis Hospital during 1926—1929.*

Advanced cases	..	..	240
Subapical cases	..	..	389
Middle zone affections	..	..	145
Apical cases	..	..	4
Hilum cases	..	..	457
Basal affections	..	..	22
TOTAL			1,497

The hilum cases, where on account of the innate or acquired resistance of the individual infection has not proceeded beyond the hilum glands, naturally constitute the vast majority of the cases. This agrees with pathological findings which have revealed latent tuberculous lesions in lungs in 50 to 90 per cent. of persons dying from other diseases. The subapical cases stand next in frequency, and then come the advanced cases and the middle zone and basal affections. The true apical involvement is very rare, there having been only 4 cases in the series of 1,497.

Table III gives the prognosis of these different types. It is interesting to note that the

within a month of the onset of symptoms fare best, that patients with a history of 1 to 6 months are the most acute, and that cases giving a longer history than 6 months have a better prognosis, being more chronic in type. The majority of cases that came under observation were in the groups giving a history of 1 to 6 months of disease symptoms, which indicates that pulmonary tuberculosis of the more acute type predominates in this country.

It is not contended that the greater severity of the disease in India and the higher mortality amongst the tuberculous is due to a small degree of immunity, either racial, hereditary, or inherent in the country, where tuberculosis has been existent for centuries, and any racial immunity that can possibly result from generalized infection has had sufficient time to be established. It is presumably the social, economic and food factors, and possibly also the enervating climate that are responsible for the severer types of the affection and the higher mortality. Poverty, insanitation, ignorance, early marriage, and the tropical climate have each and all a part to play in this marked difference between the severity and prognosis of the disease in India and in the west; and the difference in the pathological localization in the lungs is most likely secondary.

TABLE III.  
*Results of treatment in the various types of pulmonary tuberculosis classified according to localization.*  
Madras Tuberculosis Hospital.

	Arrested.		Relieved.		No result.		Total number.
Subapical	64	40.4%	54	34.1%	40	25.4%	158
Hilum	103	60.9%	54	31.9%	12	7.2%	169
Middle zone	36	45.5%	24	30.3%	19	24.2%	79
Advanced	15	25.0%	21	35.0%	24	40.0%	60
Basal	4	18.2%	7	31.8%	11	50.0%	22

advanced and basal affections give the worst results, the middle zone and subapical affections stand next, and the hilum involvements are the most favourable.

Table IV gives an idea of the prognosis according to the duration of the disease. It is very interesting to note that patients coming

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(3) Kingston Fowler (1921). *Pulmonary Tuberculosis*, p. 117.  
(4) *Ibid.*, p. 235.

TABLE IV.  
*Comparative results of treatment of cases according to duration of disease in Southern India.*

Duration.	Benefited.		No result.		Total.
One month and less	55	95%	3	5%	58
One to three months	89	75%	29	25%	108
Three to six months	80	72%	31	28%	111
Six to twelve months	77	78%	21	22%	98
Twelve to twenty-four months.	53	79%	14	21%	67
Twenty-four months and above.	73	88%	10	12%	83

# ON A SIMPLE SOLIDIFIED HÆMOGLOBINISED SALINE AGAR MEDIUM SUITABLE FOR SURFACE CULTURES OF LEISHMANIA AND ALLIED FLAGELLATES.

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In another communication<sup>(1)</sup> published in 1912, the author of this memoir has described the value of a simple hæmoglobinised saline solution as a medium suitable for culturing *Leishmania* and allied protozoa, and this has been the medium of choice in his hands and subcultures have been successfully kept up from month to month with ease, from the original virus isolated from human cases 18 years ago, as the fluid does not appreciably alter in composition or density and the flagellates are found active even after six weeks. But, there are one or two drawbacks in dealing with cultures in a fluid medium and these are (1) the difficulty of obtaining large quantity of the flagellates, when required for special purposes, and (2) the manipulations required for washing these free from the liquid in which they flourish are far too complex and laborious when one has to deal with them or their products in bulk and purity. These difficulties are best met by having surface growths on solidified media to allow of their being scraped off the surface as in bacterial cultures. Nicolle and Manceau had described the possibility of obtaining growths in solid media in 1911, and later,<sup>(3)</sup> the author of this paper had also referred to the nature of these growths in the form of a film in the dry part of the NNN medium, above the water line of the condensation fluid. In describing the different stages of the morphology of these parasites in their reversion from the flagellates to the body forms, it is regrettable that no further efforts were made in this direction until recently. To J. C. Ray belongs the credit of reviving one's interest in studying these cultures in solidified media by the demonstration<sup>(2)</sup> of his results at the meeting of the Royal Society of Tropical Medicine and Hygiene (London) in June 1929. In this demonstration Ray used for his solid medium Noller's formula, consisting of equal parts of a glucose peptone agar and defibrinated rabbit's blood, which is added to the agar at 55°C. while it is still liquid, and therefore it is almost identical with that originally recommended by Novy and MacNeal, and cultures are made by planting the infecting material on the surface of this nutrient blood agar mixture in Petri dishes. But unfortunately this technique of plating often proves unsatisfactory for maintaining the cultures free from contamination, during the long time of at least two weeks required for obtaining a fair quantity of the culture, and this is

why the author of this memoir has ventured to submit the result of this investigation regarding the technique and composition of his culture medium, bearing in mind the virtues claimed by him for the simple hæmoglobinised saline solution going by his name. These qualities are the simplicity of the composition, the ease and expedition of manufacture and the economy in the use of rabbit's blood available, and the simplicity of the technique to afford the optimum conditions for the cultures to thrive in and survive without contamination for several weeks, and thus minimize the labour and trouble of sub-culturing at frequent intervals. The composition of the medium is the same as that of the hæmoglobinised saline solution but with the addition of a suitable quantity of agar necessary to yield a satisfactory slope in test tubes, when the mixture is allowed to set.

*Technique.*—For this purpose an ordinary three per cent. agar medium is made in normal saline, and of this 6 c.c. each are distributed into wide test tubes (one inch diameter), sterilized and stocked. When required the agar is melted and an equal quantity of the hæmoglobinised saline is added to each tube at 55°C. when the agar is still liquid, and the tubes are sloped and the mass allowed to set. The simple agar basis may be replaced by nutrient peptone agar with or without the addition of glucose, and the NaCl of the simple normal saline by Ringer's fluid, and although these modifications may have each its own advantage, the main part of the technique is (1) the use of wide test tubes to do away with the plating in Petri dishes, and (2) the addition of hæmoglobin solution instead of defibrinated blood for economy (as 6 c.c. of this can easily give 16 culture tubes). For after all it is the saline hæmoglobin, even in dilution, which is the nutrient for the parasites' growth.

There are one or two technical details which, being found important by experiment, may be mentioned in this connection.

1. It is essential to have a dry surface, i.e., free from drops of condensation fluid, at the site of inoculation. This is secured by allowing the slopes to remain undisturbed overnight and then letting the condensation fluid collect at the bottom of the slopes by having them upright first at 37°C. for some hours, and then in the ice box, and when all the condensation fluid has drained to the bottom, to suck this up with a pipette and let the slopes rest for some hours with the flat surface uppermost. Then inoculate the surface carefully, with a drop or two of the infecting material (which may be either from an active culture in the NNN or Row's medium, or from an emulsion in normal saline of a loopful of a suitable surface growth) taking the precaution to confine the limits of the inoculated area well within the borders of the dry surface and from the bottom, and leave the infected tube in the

slanting position for some minutes with the planted patch uppermost, until the infecting material has practically dried on the agar surface, *vide* Fig. 1.

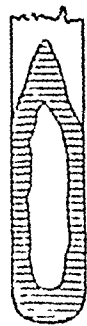


FIG. 1.

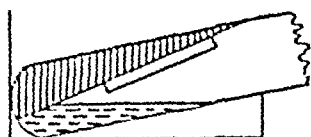


FIG. 2.

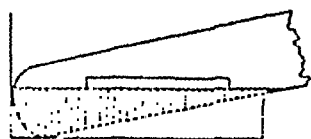


FIG. 3.



Solidified haemoglobin agar.



Water of condensation



Patch of infected area.

2. Add carefully one or two c.c. of this sucked up condensation fluid or normal saline to the infected tube without wetting or touching the infected part of the slope, and incubate the inoculated tube at 20 to 22°C. placed with the planted surface downward. This is important if one wishes to have a rich flagellate mass, because the inoculated flagellates will grow best in surface culture, when they are in an atmosphere saturated with moisture, and this is provided for by the condensation fluid lying in a layer at the bottom along the side of the tube so placed and at the same time separated from the inoculated surface, *vide* Fig. 2.

If these details are not attended to and if the slopes are allowed to be in the cold incubator without the addition of the normal saline and with the planted surface uppermost, *vide* Fig. 3, the agar medium tends to dry up and the oxy-haemoglobin saline gets both concentrated and altered into met-haemoglobin by age and desiccation and, instead of having a flagellate culture, one gets a reversion to the O body stage as described elsewhere(3) by the author of this memoir.

3. These two positions of the infected tube in the incubator, and the presence or absence of an atmosphere saturated with moisture determine the morphological characters of the parasite, and have to be selected according to the particular phase of the parasite one chooses to experiment with.

4. The superiority of the surface growth on the solidified haemoglobin agar medium, over the cultures in haemoglobinised saline or NNN medium lies also in affording one the possibility of utilising a surface culture, even if contaminated in parts, for isolating the parasite in pure culture, and thus reducing one's considerable anxiety of sub-culture under these unforeseen accidents.

### Characters of the Cultures.

The macroscopic appearances of a good culture are:—

1. A thin gummy film on the planted patch, transparent like the film of water on a glass surface, but tending to be slightly translucent with age and richness of the crop. Microscopically, there is nothing special to add to the previous observation, beyond the striking richness of the parasites even in the thinnest films.

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### ANGIOMA, TREATMENT BY DIATHERMY.\*

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ANGIOMAS are tumours composed of channels filled with blood or lymph. Different names are given to them according to shape and size, or the nature of the material filling those channels.

Different authorities hold different views as regards their origin, their modes of growth, and their relation to the general systemic circulation. While treating cases of various types and in their various stages, by the diathermic method of treatment, particularly when, instead of completing the whole treatment in a few seconds time, one adopts the slow and persistent method, as I now prefer to do, under which very small fragments of coagulated tissues are gently scraped away, where we find different tissues composing the tumour responding differently to the effect of current and where we are inadvertently led to change the strength, type and the direction of current according as we approach the different depths and the different parts of the tumour; the view that appeals most to us is the one held by Ribbert, who tried to prove his point by injections. According to him angiomas take their origin from the embryonic anlagen which were destined to form circulatory vessels and which, for reasons unknown, could not take part in the formation of the general haemolymph system. It is one of those types of tumours which Albercht defines as hamartomata.

True angiomas, then, are not mere dilatations of blood or lymph vessels of the general systemic haemolymph system. They are not governed by the laws that govern the

\* A paper read before the Clinical Meeting of the British Medical Association, Calcutta Branch, held on 14th February, 1930.

distribution of the systemic vessels. They, like all other neoplasms, are supplied with blood-vessels, but do not stand in intimate anastomotic relations with the adjacent circulation.

The blood-spaces forming the tumour are intimately mixed up with their nutrient vessels. The proportion of these two types of channels varies differently in different cases. On this fact depends the extent and character of hæmorrhage after injury or ulceration, the reducibility under pressure or the reduction in size after hæmorrhage, the presence of pulsation and so on.

The colour of the tumour varies according to whether the channels are filled with lymph or blood, whether there is a preponderance of capillaries or venules of the nutrient set, and whether pigments have accumulated in the supernatant skin—the amount and colour of such pigment. The final colour of the tumour, then, is the result of all these three factors working together in different proportions. The colour of the same tumour varies during the course of diathermic treatment, and that according as the treatment, in its successive stages, can produce an effect on these different factors. When diathermy acts more on the true channels of the tumour, either by coagulation, toning up the vessel wall or causing fibrous tissue formation around them, the tumour, if it be a hæmangioma, fast loses its bright-red or brick-red colour. On the other hand, when the diathermic heat and current influence more the nutrient set of vessels, a general loss of colour is noticed. And when diathermy facilitates the cutaneous circulation most, the pigments accumulated therein are quickly dispersed and the true colour of the neoplasm soon becomes evident. I have seen cases where the bluish colour of the skin totally misled me to think the tumour to be a lymphangioma, but as soon as the cutaneous pigments began to dwindle away the actual red colour of the hæmangioma became manifest and clear. The dispersion of cutaneous pigments overlying angiomas also takes place when, for some reason, the tumour is inflamed, as with increased circulation the phagocytic cells get a chance to carry away these pigments.

Angiomas are either congenital or acquired. The usual types are—hæmangioma, lymphangioma, capillary or simple and cavernous angiomas, border-line and mixed forms. Plexiform or circoid angiomas of the scalp (tangled masses of pulsatile arteries). The lymphangomas are usually extensive and more diffuse than hæmangiomas,—macroglia, elephantiasis, scrotal tumours are the examples. Some of the cavernous or cystic types are called cystic hygromas, and others are endotheliomas.

The complications that may occur are:—

1. Circulatory disturbance.
2. Infection leading to inflammatory reaction in their substance. Lymphangiomas may

have periodical inflammatory reactions in this country, owing to filarial infection.

3. Ulceration and hæmorrhage.

4. Thrombosis with or without phlebitis, which may end in spontaneous healing.

The angioma may be a slightly raised but flat one, or a distinct fungating growth with or without a pedicle, or it may be wine-glass shaped—a growth with a base and a pedicle.

It may be situated in the skin of the face, scalp, groin, or any other part of the body. It may be in the muscle, as in the tongue, lips, intestines, urethra, and so on. It may also be in the internal viscera, such as the liver, cardiac valves, etc.

The cases that came under my treatment comprised a group of about forty, which practically covered the whole range of various types and stages of the growth. Those cases that are reported here while relatively few in number present different characteristics, and demonstrate the principal types of angiomas as well as the methods of application of diathermy suitable for each.

*Case No. 1. Urethral Caruncle.*—Mrs. J. G., Hindu female, aged 26 years. Operated on 18th April, 1929.

Since about a month previously she felt pain during micturition. She never suffered from urethritis or any other condition of the genito-urinary system to which this symptom could be ascribed. The pain during micturition gradually grew worse and in three or four days' time the patient felt some thickening about the urinary orifice. Both the pain and the thickening went on steadily increasing. There was no improvement under ordinary methods of treatment.

Under local anaesthesia the urethra was dilated, urethroscope examination made, and on puncturing the tumour nothing but blood came out. It was therefore diagnosed as a hæmangioma situated in the muscular coat of the urethra, covered with squamous epithelium. The pain was due partly to the pressure of the tumour on the nerves with which the part abounds, and partly to the obstruction and congestion consequent of the tumour growth.

It was a red sprouty swelling, affecting not only the posterior lip of the urethra, but had extended and involved the orifice all round. The constant strain during micturition, which was extremely painful, and the weight of the growth led to the prolapse of a portion of the urethra.

For want of a more appropriate name I call this tumour a urethral caruncle, which is believed to grow on the posterior lip of the female urethra. The tumour must have started somewhere on the external urinary meatus as a minute thing, but like all other fast-growing angiomas, which either from the beginning grow quickly or by trauma or some such stimulus stirring up dormant things to grow fast, it had extended and involved the urethra all round.

The pain was 50 per cent. less after the first application of diathermy. The tumour with all its symptoms disappeared after five applications. The urethra was slightly patulous for a fortnight more. The little fibrosis and thickening that appeared at the sight of the tumour, as a result of diathermic treatment, took about a month to disappear altogether. There is a danger of overdoing things in a case like this, as excessive treatment might lead to massive fibrous tissue formation and, the distribution being all round the orifice, this might lead to fibrous stricture of the urethra.

*Case No. 2. Hæmangiomas on the groin and on the scrotum.*—Mr. S. C. B., Hindu male, aged 34 years, saw me on the 26th May, 1929.

A red papule appeared on the right side of his scrotum, some four months previously. About a month

and a half after this, a similar one appeared on the groin. Both these went on growing till he came under diathermic treatment, as is shown in the illustration. The colour of these two tumours was different, the one on the groin was reddish, with an exceedingly thin supernatant skin, and composed of capillaries, whereas



Case No. 2. Hemangiomas on the groin and on the scrotum, in a man aged 34 years.

the one on the scrotum was rather bluish—evidently composed of venules.

Altogether seven treatments were given to these, four to the groin one, as the skin was very thin and would not stand strong current, and three to that on the scrotum.

Case No. 3. Lymphangiomas on the right arm—R. G., a Christian female child, aged 5 years, was brought to me on the 12th October, 1929.

There were three patches of swelling—two on the forearm and one on the upper arm of the same side—on the right side. All of them were flat-topped, present from birth and considered to be birth-marks. They were more pigmented previously. Since about a year these patches became inflamed several times. During the inflammatory attacks the areas used to get swollen, thicker, more extensive, pinkish in colour (not bluish, its original colour) and painful, accompanied with a rise of temperature lasting for one, two or three days. All these signs of inflammation used to come on and disappear together, then everything came back to the status quo, except perhaps, what was lately noticed, that the areas were losing the extra pigments they had.

I gave her altogether seven applications of diathermy, every two or three days. The effect noticed after the first application was that one of them turned from blue to brown and dwindled in size. After the second application all the three patches became tougher and harder. During the course of the treatment, which took about a month, the usual periodical inflammation came on only once and then was of a very mild type. Since the treatment was completed, which is now about a year and a half, she has had no complaint. Now, there is practically no evidence of tumours except slight thickening of skin.

The points to be noted about this case were—although the tumours were bluish in colour they had nothing to do with the venous system, the colour was imparted to them by the hyperpigmentation of the superjacent skin. So, after the inflammatory attacks, which increased the circulation of the parts, the phagocytic

cells had opportunities to carry away the pigments with consequent reduction in the depth of bluishness. The effect of diathermic treatment was first, as in all other inflammatory conditions, to reduce the inflammation and its occurrence, and secondly, not to coagulate the contained lymph, as is popularly believed, but to tone up the vessel walls and stimulate the fibrous tissue formation in the area, which added strength and support to the dilated vessels, and to stimulate the sympathetic nerves, which is just the reverse of what is brought about by sympathectomy. In a case like this these three factors working together bring about a change, which prevents inflammation and tones up the dilated vessels. But there always remains a little toughness of the skin, produced by the newly formed fibrous tissue. The skin may grow unnecessarily thick, owing to excessive diathermy.

Case No. 4. Hemangioma—a pedunculated, cauliflower-like mass with a broad base, of the shape of a port-wine glass, and the size of a small lemon, growing on the right cheek of Mr. S. C. K., a Hindu male, aged 35 years. He consulted me on the 25th September, 1929.

One and a half months previously a pimple appeared on his right cheek, the contents of which he pressed out. After this it did not heal, but grew bigger and bigger. Any attempt to clean it would produce a severe hemorrhage. He was admitted as an in-patient to hospital, but refused to be operated upon in the ordinary surgical manner, as this would produce great disfigurement. Another tumour of a similar nature was



Case No. 4. First Picture. Immediately before Diathermic Treatment.

removed from the groin of the same patient in the same hospital, which on histological examination proved to be an angioma.

At the time when diathermy was first applied, 25th September, 1929, the tumour was a pedunculated, cauliflower-like mass, with a broad base, of the shape of a port-wine glass, and the size of a small lemon, growing on the right cheek, as is shown in the first picture of the case. The surface was ulcerated and the hemorrhage was profuse while changing the dressing.

In this case the methods of treating the actual growth, the pedicle, and the base were not the same. As the covering skin was lost from the distal surface of the tumour, no consideration had to be taken about preserving it. It required coagulation straight away, the intensity of which had to be varied from the surface towards the root, so that no line of demarcation or a

quick separation of the slough could take place. The treatment was repeated pretty frequently to prevent hæmorrhage, and the slough separating. The previous day's dressings were removed to such an extent as not to start bleeding. The remaining dressing was soaked with warm saline and the diathermic current switched



Case No. 4. Second Picture. Four days after the treatment.

on. After a few minutes the current was switched off, the remaining dressing could then be removed easily without disturbing the vessels. The surface of the tumour was then gently scraped, and all coagulated and dead tissues lightly separated. Then the treatment



Case No. 4. Third Picture. After seven days' Diathermic Treatment.

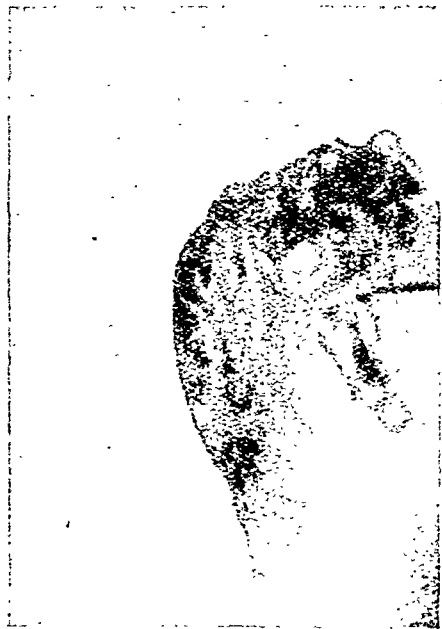
proper was given. As I have mentioned before, the type of current used for the fungating growth was strong enough to produce coagulation.

On the fourth day, as is shown in the illustration, I could pinch off the last portion of the out-growing

mass. The coagulated vessels with their contents could be taken out easily, like roots coming out of the ground, leaving behind a small pitted area, which is quite clear in the illustration.

From the fifth day onwards I had to use weaker currents, but for a longer duration, so as to help toning up of the vessels forming the base, as well as to produce fibrosis there. I was successful in attaining both these ends, so that by contraction the small punctured area of the stock shrivelled and disappeared, leaving practically no scar behind, and the basal portion of the growth gradually settled down without producing any breach in the skin. The only thing that remained for a time—for a month more—was a little thickening of the skin at the basal area, which could only be detected by palpation, as is shown in the third picture of the case.

*Case No. 5. Cirroid Angioma of the Scalp.*—21st November, 1929. Mr. R. C. C., Hindu male, age 27 years. About 28 days before, the patient noticed, while combing his hair, a red swelling of the size of a small pea on his right temporal region. No heed was given to it and it was expected that it would disappear of itself. But on the contrary it began growing in size and became darker in colour. In four weeks' time it attained the size of a big marble, when I saw him first, as is shown in the illustration. The tumour could be reduced, or the whole thing could be made to disappear under pressure and manipulation. Lately the hairs in it began to fall off and the tumour became painful and



Case No. 5. Cirroid Angioma of the scalp.

tender. Feeble pulsation could be elicited at the periphery as well as at the base of the tumour. It was closely connected with the skin, and was freely moveable over the subjacent tissues. There was no history of trauma of any kind. He had been suffering from beriberi for over two months. There were several small ones of the same type growing on different parts of his body.

I gave him two diathermies with flat electrode on the surface of the tumour. This led to a desquamation of the superficial layers of the epidermis, although the tumour dwindled in size and became firmer. I had to stop this, as a denser coagulation in the overlying thin and stretched skin might lead to sloughing, leaving an open ulcer and a liability to secondary hæmorrhage. So I tried electro- or thermo-coagulation with a needle. After three attempts the tumour became very small and very hard. About a fortnight after the last treatment



the skin became normal. No sign of tumour was there and the hair had grown again.

*Case No. 6. Haemangioma.*—5th January, 1930. Mr. A. C. B., Hindu male, aged 25 years. Three months previously he first noticed a pin-point red pimple on his left knee-cap which slowly grew to the size of a pea. The superjacent skin was thin and glossy. The pimple would not disappear, or alter in size under pressure. It had a cystic feel.

Three days before, while getting into a tram car, he knocked his knee and the pimple began to bleed profusely, this being controlled by sustained pressure. Since then slight friction of the clothes or slight trauma started the bleeding, which continued in like manner. Every time the haemorrhage took place the patient noticed a stout vessel running across the spot becoming prominent.

*Diathermy* was applied for ten minutes on the 5th January, 1930.

Such haemangiomas are usually very small things, they appear suddenly, with some preliminary irritation of the part which actually draws the attention of the patient. The full size, although very small, is attained almost all of a sudden. They remain stationary and cause no trouble in most cases. They are situated in the surface layers of the skin where there are no blood-vessels, but the bright red colour of the pimples may be due to pigment or the colour of the blood which is more related to the arterial side and constantly changing. They usually appear on the face and chest and less commonly so on any part of the body. When they appear on the knee, elbow, clavicle, or where the surface skin may be rubbed off by injury, they bleed and that profusely. This bleeding obviously proves that they are vascular things. The pathology appears to be that sprouting capillaries from the deeper layers of the skin grow towards the surface due to some stimulus, pushing through every other layer except the stratum corneum. This horny layer with a portion of the stretched out rete mucosum forms the shiny smooth covering of the growth. The growth is too small to be broken easily, unless so situated as to be pressed between the bone and a hard substance.

After the single treatment given he never bled since, though it was as much open to injury as before. Next day half of the growth was filled with coagulated blood and in ten days' time the whole growth was replaced by a crust. This crust in four or five days' time fell out as a scab, leaving a perfectly normal surface level with the surrounding skin.

### PETROL DERMATITIS.

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MAJOR, I.M.S.,

and

P. P. CHOWDRY, M.B., B.S.,

CAPTAIN, I.M.S.,

Quetta.

THE literature dealing with petrol dermatitis, or with burns due to prolonged immersion in petrol, or to prolonged exposure to petrol vapour is singularly scanty.

We have been able to find only two references to such, and the Gas School at Belgaum could produce nothing on the subject. The following case is therefore of interest.

A coolie while working at the manhole of a large petrol tank, apparently overcome by the petrol fumes, fell into the tank, the bottom of which was covered with petrol to a depth of not more than two inches. Two men in the vicinity of the tank failed to get the coolie out on account of the suffocating effect of the

petrol vapour. One hour later an N. C. O. of the R. A. M. C., wearing a gas mask, entered the tank, tied a rope round the man's body, and thus he was eventually got out. The man was at once taken to the Indian Military Hospital, Quetta.

On admission he was quite unconscious, pulse imperceptible, breathing laboured.

Blisters, most of which had burst, had already formed on every part of his body, much more than half the superficial skin area being burnt.

The patient was placed in the open, the little clothing he had removed, and oxygen inhalations with injections of strychnine and digitalin given.

The patient was wearing cotton pyjamas, a cotton shirt and a waistcoat, all of which were soaked in petrol.

At 4 p.m., five hours after being removed from the tank, he regained consciousness, was very restless and complained of severe thirst, to relieve which he was given copious draughts of water. His pulse, 80 per minute, improved in volume and tension. Temperature 97° F.; respirations 22 per minute. There were no signs of oedema of the larynx, the lungs were clear, and urine was passed freely and was free from albumin.

The patient made no complaint of pain.

The burns, which were of the second degree, were dressed with half per cent. picric acid solution.

The following morning the patient was comfortable, the lungs were clear and the urine free from any trace of albumin.

Small discrete ulcers were seen to be forming on both corneae.

On the third day the patient seemed to be progressing favourably, but the onset of severe diarrhoea, which was readily controlled with bismuth salicylate, added to his discomfort.

On the fourth day the eye condition was much worse, the eyes presenting the appearance of a traumatic conjunctivitis with lachrymation and photophobia, with superimposed dermatitis of the lids. The dull greyish white necrosed areas on the corneae spread until the whole surface of both corneae was involved. Despite deep ulceration perforation did not occur, but there was considerable shrinking of the eye balls, which before death presented an appearance similar to that which one associates with old blind eyes.

On the fifth day the general condition of the patient was very much worse; and from that date he went rapidly down hill, and died on the ninth day.

After the preliminary dressing with picric acid No. 7 paraffin was used, but it was very evident that the change to the oily dressing produced marked irritation, the patient constantly attempting to remove these dressings. The fact that oily dressings cause pain in these cases was noted by Page.

That any part of the skin condition was due to prolonged exposure to petrol vapour alone is very unlikely, because the unfortunate man may have rolled about in two inches of petrol before becoming completely unconscious.

The cause of death may have been due to a toxæmia the result of sepsis, or the direct result of poisoning by petrol absorbed and inhaled. Petrol is a complex mixture of the lighter series of hydrocarbons and among the symptoms of poisoning by petrol are a feeble pulse, insatiable thirst and restlessness at night, all noted in the case described.

Page (Petrol Dermatitis, *Practitioner*, 1918), who, during two years with the Royal Naval Air Service in Flanders, saw numerous cases,

states that the lesions resemble burns of the first and second degree, that is to say, there is erythema with some vesication, with a considerable amount of pain. His treatment consisted in the use of lead lotion or of zinc carbolio lotion (zinc oxide drs. 3, suspended with glycerine ozs. 1 in 1 per cent. carbolio acid solution to ozs. 8), applied on lint or sponged on. He points out that grease of any sort increases the discomfort. As the symptoms subside, which he states they rapidly do, a simple dusting powder is used, the affected parts being left uncovered in warm weather, a cradle being used to support blankets if these must be used.

Schwald (Veratzung durch Benzin, *Deutsche Med. Wochenschrift*, 1913, August) states that benzine causes marked erosion and even necrosis if brought into contact with the skin in such a way that its evaporation is prevented or delayed. This, he points out, has been observed in cases of abdominal operations when part of the benzine used for disinfection flowed down to the sacral region, to the buttocks and behind the thighs where it could not readily evaporate. The effect was also noted when lumbar puncture wounds were covered with gauze saturated in benzine and fixed with adhesive tape; also in cleaning the lobe of the ear with benzine when some of it flowed into the ear giving rise after a few minutes to severe pain. As he points out, no therapeutic use has yet been made of this property of benzine.

#### SOME OBSERVATIONS ON THE PREPARATION AND EXAMINATION OF THICK FILMS FOR MALARIA PARASITES.

By R. A. MURPHY, L.R.C.P. & S.I.,  
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In a country such as Assam where malaria is endemic it is imperative for the doctor to ascertain whether his patient is infected with the parasite of this disease, even although such may not be the primary cause of the illness. The information however, can only be conclusively obtained from blood films, and if these cannot be prepared and examined with confidence, the patient will suffer from the lack of a precise diagnosis.

In the days when only thin films were used, findings used to be somewhat discouraging, for hours might be expended on some preparation, and nothing found, although the diagnosis was clearly malaria, confirmed, perhaps, by films taken subsequently.

The introduction of the thick film method marked a great advance, for although it has difficulties of its own, and some experience is required to make good use of it, the infections are few in which it is not possible to ascertain within a very few minutes that parasites are

present, even though the appearance may not be very typical, nor the species a certainty.

The rapidity with which parasites can be found in thick films is not entirely due to the greater quantity of blood which can be examined in a given time, but is largely due to the fact that fields can be rapidly passed over, the parasites standing out so definitely on the clear, or faintly stained background. Moreover, the parasites most likely to be missed in a thin film are the small *P. falciparum* rings, either because, on account of their minuteness, they require careful focussing to pick them up, or because they sometimes take the stain badly. But in a thick film they stain well, and the ring appearance is better preserved. Not infrequently the thick film will show the young rings of this species in large numbers, and yet in the thin film they will only be seen with great difficulty, or may appear not to have taken the stain at all. The Romanowsky stain in the hands of the expert in a laboratory may be absolutely reliable, but in general use it is fickle, and the causes are hard to find. One part of a thin film may show well-stained parasites, while in another part they are not stained at all.

One of the simplest methods, and suitable for those in general practice, is to make the thick film at one end of a slide, and make also a thin film on the same slide, about three quarters of an inch separating the two films. The thick film may be made by taking four drops of blood and joining them, as generally advised, but quite good results can be got by taking one large drop and spreading it to the correct thickness. It should be especially thinned out at the edges, and young parasites will be best seen there. To stain, the films are divided by a grease line, and after double the quantity of water has been mixed with Romanowsky stain on the thin film, it is drawn over the line on to the thick.

It cannot be over-emphasised that to get the best results with thick films they must not be too thick, and they must be clean. It is difficult to define the required thickness, but when stained the thick film should appear to the naked eye very little thicker than the thin. The care necessary for the cleanliness requisite is not easy to teach to some, but the method largely loses its value if continual halts have to be made to examine foreign matter. The films must be very carefully protected, especially while drying, against dust and insects.

In thicker parts of a film the young *P. falciparum* rings do not show up well, but may be spotted as faint blue rings. In the thinner parts they are seen with great distinctness, both nucleus and protoplasm deeply stained, making well-formed rings. The large number, early division of the nucleus, and small size help to indicate the species. Other species do not show such small delicate rings, but

*P. falciparum* may on occasion show up as fairly large substantial looking rings. Older forms are not uncommonly seen in thick films, and, as pointed out by Knowles, even the sporulating stage is not infrequent, and these are quickly picked up by the small compact mass of pigment. The spores may be well-stained in every detail, or only pigment and protoplasm may be apparent. These older forms can with diligence often be confirmed in the thin film, and one of the advantages of the thick film is that it quickly indicates whether a prolonged search of the thin film is likely to be rewarded. Incidentally, this also holds for *Piroplasma* infection in animals. It is well to bear in mind that the more mature forms of *P. falciparum* may be found, or they are liable to be miscalled *P. malariae*.

Crescents are easily detected, but may appear foreshortened, even to the extent of a round mass of protoplasm surrounding the pigment, and then may be mistaken for sporulating parasites, but the pigment is more diffuse than in the latter. The ingested pigment of the mature schizont is shown very strikingly in the leucocytes, and the little mass with its characteristic size, shape and hue is unmistakable. In heavy infections this pigment may be so plentiful that at first glance the film might be condemned as dirty.

*P. vivax* appears according to type, but where a film is too thick only the protoplasm may be obvious, and in half-grown parasites this may be broken up into two or more rounded blue masses. The larger size of this species, and the fine light brown pigment, are distinctive, and the pigment contrasts strongly with the heavy black pigment of *P. malariae*.

Diagnosis of species from thick films alone does not come easily at first, but as experience is gained most parasites can be placed correctly. If one film is used as a complement of the other, the proportion of error remaining will not be sufficient to invalidate percentages drawn from a series of observations.

#### ON THE ROLE OF *ARGAS PERSICUS* OKU, IN THE TRANSMISSION OF *PASTEUR-ELLA AVICIDA*.

By B. C. BASU, M.Sc.,

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*Pasteurella avicida* is the causative organism of chicken cholera or fowl plague, which frequently affects these birds in sudden epidemic form.

Moritz in 1869 first noticed certain "granulations" as he termed them, in the bodies of birds which had died from this disease. Nine years later Perroncito sketched the microbe. Detailed observations were not made on the disease until 1879-80, when Toussaint demonstrated that a microbe was the cause of the infectivity of the blood, and Pasteur observed

that birds, when fed upon the smallest drop of a recent culture of the micro-organism, became infected via the alimentary canal, and that the infected excreta were a cause of contagion to clean fowls.

In the present paper the writer gives the results of observations made in 1928 as to the rôle of ectoparasites of fowls in the transmission of this disease. For this purpose the common fowl ticks, *Argas persicus* Oku, were collected from Calcutta fowl houses, and fed on birds infected with *Pasteurella avicida*. In order to infect the fowls, as a rule 200 million *Pasteurella* from a 24-hour culture were inoculated intravenously. Invariably, as tested in ten fowls, *Pasteurella* was isolated in blood cultures from such inoculated birds, ten hours after the intravenous injection.

Eight "clean" fowls were taken, and blood cultures taken from each to make certain that they were free from *Pasteurella* infection; in all, the cultures remained sterile. These eight birds were now made to ingest ticks, which had been fed from 1 to 20 days previously on fowls suffering from *Pasteurella* infection. After this the blood of each fowl was cultured daily till the bird died.

Of these 8 birds, 1 died the day after the injection. Of the remaining 7, 2 became infected. One bird, which had ingested 30 ticks fed 4 days previously on a *Pasteurella*-infected bird, became infected 3 days after swallowing the infected ticks; and the second fowl, which had ingested 50 ticks fed 1 day previously on a *Pasteurella*-infected bird, became infected on the second day after the feed. Fowls thus infected lived as long as 7 days after the first appearance of *Pasteurella* infection in the blood stream, whereas, on the other hand, birds inoculated intravenously with culture usually die within six hours or so of the injection, which proves rapidly fatal. (In all these experiments care was taken that there should be no chance of the birds becoming infected by the dejecta of infected birds contaminating their cages or food, and being swallowed.)

In Nature fowls are rather fond of picking up and eating ticks, and it seems possible that *Pasteurella* infection might be acquired in this manner. On the other hand naturally acquired *Pasteurella* infections are apt to be extremely virulent and to kill rapidly, whereas the infections contracted by ingesting infected ticks are milder and less rapidly fatal. It would appear that there is some loss of virulence of *Pasteurella avicida* in the gut of *Argas persicus*.

*Cimex hemiptera*, the common bed-bug is frequently found in fowl houses and feeds readily on fowls. Experiments were carried out to see whether it was possible for *Pasteurella* infection to be acquired by ingesting infected bed-bugs. Three clean fowls were made to swallow bed-bugs fed from 1 to 3 days previously on *Pasteurella*-infected birds. None of them became infected. It seems probable that

*Pasteurella avicida* does not survive in the viscera of *Cimex hemiptera*. (As is well known, the bed-bug is a pure blood feeder, and the contents of its gut are bacteriologically sterile; possibly its gut may contain bactericidal principles.)

Further experiments were also carried out to see whether these ectoparasites could convey the infection by their bite. The blood of 7 clean fowls was cultured in order to make certain that they were free from *Pasteurella* infection; all the cultures remained sterile. Ticks, fed from 1 to 41 days previously on *Pasteurella*-infected birds, were next re-fed upon these seven fowls. After this the blood of each bird was cultured daily. Out of the 7 birds only 1 became infected, the incubation period being 2 days. This was a bird, which had been bitten by ticks which had bitten the *Pasteurella*-infected birds 14 days previously. Results in the case of this bird appear to be rather anomalous, and it is difficult to say definitely what was the mode of infection in this case.

Bed-bugs (*Cimex hemiptera*) fed 3 days previously on *Pasteurella*-infected birds were re-fed on 2 clean fowls (whose blood had been previously cultured and had been proved to be free from *Pasteurella* infection). Neither bird contracted the disease. It would appear that the bed-bug is a much less hospitable host to *Pasteurella avicida* than is *Argas persicus*.

The causation of epidemics of fowl cholera gives great scope for investigation, and the question is of great economic interest. Pasteur, as well as several other eminent observers, noted that the onset of these epidemics is always sudden. The question naturally arises as to what is the source of infection in such explosive outbreaks. During the outbreak, infection usually spreads via the contaminative route, the food of clean fowls becoming infected with the dejecta of infected birds. This holds good for the spread of the epidemic, but will it account for its origin and sudden appearance? *Pasteurella avicida* is a very delicate organism; it is easily killed by desiccation, by heating to 55°C., by antiseptics, and by very dilute acids; it does not form spores; therefore *Pasteurella* organisms passed in the faeces of infected birds on to the soil are not likely to survive for long under ordinary conditions of atmospheric temperature and humidity.

The question arises whether infection may persist in the off-season in the invertebrate host, *Argas persicus*, and the onset of the epidemic be initiated by the ingestion of infected fowls ticks by clean fowls. Kelser (1927) theorises as follows:—"Organisms of the *Pasteurella* genus are widely distributed in Nature. They are very frequently found in the upper air passages of normal cattle, horses, swine, sheep, dogs and cats. Less frequently they are found as normal inhabitants of the intestinal tract. Thus in a way they are more or less facultative pathogenic bacteria, being present

in normal animals, and only producing disease when the normal resistance of the animal is lowered, or following a particular increase in the virulence of the organism, which in some unknown way seems to occur."

My thanks are due to Dr. B. M. Das Gupta, Assistant Professor of Protozoology, Calcutta School of Tropical Medicine, for much valuable help received during the course of these investigations.

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## A Mirror of Hospital Practice.

### AN EXTRAORDINARY CASE OF SELF-MUTILATION.

By H. R. SHARMA, L.M.P.,

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M. T. M., aged 27, of Kywe Chan village, was brought to the Civil Hospital, Kalewa, on 22nd September, 1929, at 9 p.m. in a moribund condition. He died within half an hour of the time of admission.

*History of the Case.*—The father-in-law of the patient stated that the latter had been suffering from inguinal hernia since childhood. At times it could not be reduced without great difficulty. On 22nd September, 1929, the hernia became strangulated and the patient made up his mind to do away with the offending part, which was so troublesome to him every now and then.

He was left alone upstairs as no human help was thought possible. In an extremely emotional state and in agony he picked up his *dah*, seated himself with stretched legs and made a bold cut on the right scrotum, 3½ inches long vertically. The innocent testicle which happened to appear first from underneath the skin was readily severed. By the release of the strangulation due to the incision, the omentum and intestines, finding a vacancy in the scrotal cavity, made their appearance through the wound and unfortunately met the same fate as the testicle. This caused some pain to the patient and so, it is said, he screamed. On enquiry from his relatives who were sitting downstairs, he replied that nothing was wrong. The intestines were obstinate and the "surgeon" was determined, so the latter went on cutting the former piece by piece, until seven pieces of the gut had been cut off, measuring 39 inches in all. When tired of cutting the gut like this the deceased attempted to pull out the whole of the offending part and cut, unsuccessfully, a piece of gut 5 feet 8 inches long. At this point the people sitting downstairs were alarmed by seeing blood streaming from above, and rushed upstairs. In fact the last attempt was unsuccessful because of their interference. Here ended the operation. The last piece of the intestines either receded by itself or was pushed back by the new arrivals. This was found next morning at autopsy. The peritoneal cavity had now become the receptacle of the cut intestines, blood and various other discharges, the natural machinery of the abdominal cavity being upset altogether.

The relatives, being afraid of the authorities, were in an awkward position, and the hospital was thought

of as the only possible shelter, so the patient, with the cut pieces, was wrapped in an old mat and brought to Kalewa to die.

On arrival in the hospital he was cold, air-hungry, extremely pale and pulseless. He was conscious, but unable to speak.

### A CASE OF AGRANULOCYTIC ANGINA.

By R. VISWANATHAN, B.A., M.B., B.S.,

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SCHULTZ in 1922 described a form of angina with necrosis of the tonsils and pharynx associated with a decided leucopenia, especially of the granulocytes. He classified this symptom-complex as a separate disease which he called "agranulocytosis." Since then more than 120 cases have been recorded under this name. Heuper has reported five cases between November 1927 and April 1928, while more recently Bocage and Filliol have described a fatal instance of agranulocytosis in a case of syphilis.

The aetiology of the condition is unknown, though most investigators are agreed in regarding it as an infectious disease of a septicæmic nature "with an atypical reaction of the hæmopoietic system due either to bacteria with a special affinity and toxicity to the granulocytic system or to an atrophy and aplasia of this organ caused by septic infection." In the case reported by Bocage and Filliol they found at necropsy the characteristic changes in the bone marrow cells described by Schultz, along with a large number of a Gram-positive micro-organism resembling *B. perfringens*. It has not been possible to incriminate one particular bacterium as to the cause of this disease since other organisms such as *Streptococcus hemolyticus*, *B. pyocyaneus*, etc., have been isolated in other cases where the same group of symptoms going under the name of "agranulocytic angina" was manifested.

The disease usually affects the middle-aged and is more common in women than in men. It often starts suddenly in previously healthy people. It also occurs in debilitated individuals after a period of prolonged ill-health, as in the case of Bocage and Filliol, where the necrotic pharyngitis started in an anæmic man after a course of N.A.B. and bismuth injections. It is accompanied by high continuous fever, dysphagia and dyspnoea. The tonsils are enlarged and hyperæmic and subsequently become necrotic. The pharynx and lingual tonsils may also suffer the same fate. Sometimes the necrotic process is found in the tongue, gums, anus, vulva, vagina and cervix. The chief characteristic is the blood picture which shows considerable leucopenia, the granulocytic cells being the first to diminish. Prognosis is gloomy in the extreme though not absolutely hopeless.

I am reporting the following case because it was very suggestive of agranulocytic angina:—

An Anglo-Indian male, aged 20 years, was admitted as an in-patient in the Government Head-quarters

Hospital, Coimbatore, on 20th November, 1928, for high fever and difficulty in swallowing. He had a temperature of 102°, pulse 98, and respiration 28. The inside of the mouth presented a very unusual appearance. Both tonsils were enlarged, almost greenish blue in colour owing to evident necrosis. The posterior wall of the pharynx was also in the same condition, while there was a patch of submucous hæmorrhage over the palate and uvula. There was bleeding from the gums as well as the tonsils. There was no enlargement of lymphatic glands. Examination of a throat swab revealed the presence of long-chained *Streptococcus hemolyticus* and no diphtheria bacilli. The blood showed marked leucopenia. The leucocyte count was below 1,500. There was relative diminution of polymorphonuclears. There was no enlargement of the lymphatic glands. The spleen and liver were not palpable.

On the second day the temperature went up to 101° and dysphagia was so great that it prevented the patient from taking even liquids. He also developed purpuric eruptions all over the body and complained of pain over the bones of the thighs and legs. The condition was decidedly one of a severe form of septicæmia. He was put on to injections of anti-streptococcal serum, calcium by the mouth, calcium by injection and stimulants such as glucose and brandy. After oscillating between life and death for some days, the patient began to improve, the temperature came down gradually, accompanied by slow separation of sloughs from the tonsils and pharynx. The temperature touched normal on the 16th day and the patient was discharged from the hospital on 13th December, 1928.

On making enquiries about the patient two months later we were reliably informed that the patient developed the same symptoms in a more virulent form some fifteen days after being discharged from the hospital and succumbed to the disease in the course of two days.

The possibilities in this case are aleukæmic leukaemia and agranulocytic angina. Diphtheria is ruled out because of the negative throat swab and fatal relapse, which is an almost unknown phenomenon in diphtheria. Against aleukæmic leukaemia, we have the absence of enlargement of the liver and spleen and lymphatic glands. Besides the duration of the disease is too short even for acute leukaemia.

The characteristic signs which suggest strongly the possibility of agranulocytosis are the necrotic condition of the tonsils and pharynx, bleeding from the gums, purpuric eruptions, pains over the long bones and high continuous fever associated with a blood picture of distinct leucopenia, especially of the granulocytes, and a fatal relapse occurring a few days after the termination of the primary attack.

### UNUSUAL SYMPTOMS IN A CASE OF ROUND-WORM INFECTION.

By S. S. PATTANAIK, L.M.F. (Cal.),  
Medical Officer, Piple, Puri District.

A SHORT time ago I was called in to see a patient in a village.

On visiting the place, I examined the patient. He was a boy about 10 years old, neither well nourished nor well developed. He had been suffering from purging and vomiting for the last two days and was in a condition of extreme prostration. He was very restless and was slightly delirious. He complained of a rather dull aching pain in the abdomen. Being a boy of only 10 years, he could not give a full account

of his sufferings, nor could he explain the exact nature of his ailments.

On examining I found the tongue was moist, eyes presenting an anxious look, pulse more or less sinking. Temperature: 102°; abdomen tympanitic and tender. During my examination the patient passed a loose watery motion, yellowish in colour and slightly frothy. I had no opportunity to see the vomited matter.

At the outset, I was inclined to think that the case was one of poisoning. The parents could give me no clue regarding my suspicion nor did they suspect of anything of the kind.

As the patient was in a state of impending collapse, to combat it an injection of digitalis and strychnin was given and a dose of stimulant administered.

Cold sponging over the forehead was ordered for controlling the delirium. Afterwards the patient was put on a mixture containing some mild astringents and carminatives; the mixture was supplemented by three powders containing intestinal antiseptics.

The next morning it was reported that the medicines had not succeeded in checking the vomiting and purging, though the delirium had subsided to some extent.

I was then told by the father of the patient that the boy had passed a big worm a week prior to his present troubles. This led me to suspect him to be a victim to intestinal worms. Accordingly I ordered a full dose of santolin followed by a dose of castor oil after an interval of three to four hours.

To my surprise, I was told in the evening that the patient passed 9 or 10 big round-worms—one coming out by the mouth.

Gradually after this the distressing symptoms began to subside. It was reported the next day that the patient was apparently relieved of all his ailments, with the exception that he felt very weak.

**Conclusion.**—There seems to be little doubt that unusual symptoms in this case were due to the round-worm infection.

### THREE CASES OF SALIVARY CALCULUS.

By MILITARY ASSISTANT SURGEON C. D. TORPY, I.M.D.,  
*British Military Hospital, Trimulgherry (Deccan).*

SALIVARY calculus is treated in most textbooks of surgery as a "rara avis." It is certainly not a very common disease, hence it is hoped that no apology is required for the publication of a few notes on three successive cases met with in the short space of two months.

The three cases that follow were all British soldiers, under twenty-five years of age, leading an active and healthy life, drinking the same water, and living on much the same diet. In all three cases, the dental condition was very good there being a total absence of any tartar formation, or evidence of pyorrhoea. None of them was a total abstainer, and all drank a certain amount of beer. Only one of them gave a previous history of calculus formation in the parotid gland during childhood.

1. *Private L.*—First reported sick with a painful, enlarged swelling "in his neck, beneath the right jaw." There was some discomfort, and pain in opening his mouth. Owing to the prevalence of "mumps" at the time, it was thought to be a case of unilateral mumps. He was isolated and treated as such. He was finally discharged after a month as "cured."

He was only a fortnight out of hospital when the symptoms reappeared. In addition to the previous enlarged swelling in his neck, he complained of a copious discharge of muco-pus into his mouth. The sub-lingual papilla appeared swollen and red, while the

mucous membrane of the floor of the mouth was also red and oedematous. X-ray findings were negative.

The patient was placed on hot saline mouth washes every hour. Later, under general anaesthesia, an incision was made inside his mouth, and the abscess opened with a pair of sinus forceps. A good deal of offensive muco-pus drained away. The calculus was felt within the duct, and portions were removed. Hot saline mouth washes were continued, and the patient made an uneventful recovery. No recurrence has since been observed.

2. *Private F.*—Reported sick with all the signs and symptoms of a submaxillary salivary calculus on the right side. No calculus could be felt, but x-ray findings were positive.

He was put on hot saline mouth washes frequently; later on incision was made inside his mouth, and the pus evacuated. The calculus was felt lying within the duct, but all attempts to remove it proved futile. Saline mouth washes were continued, and the patient was greatly relieved. In a few days time the symptoms all re-appeared and it was decided that excision of the gland was necessary. Under a local anaesthetic, a curved incision was made above the hyoid bone, and the submaxillary gland removed *in toto*. The patient made an uninterrupted recovery, and was discharged fit.

3. *Trooper W.*—Reported sick with a painful and enlarged right submaxillary gland, and offensive muco-pus discharge into his mouth. A calculus was felt projecting at the entrance of the duct; x-ray findings were negative. Hot saline mouth washes were given every hour, and the next day, much to the surprise of the patient, and his nursing attendant, he spat out the offending body, and made a speedy recovery. He was discharged as apparently cured.

After an interval of three months, free from all symptoms, the patient reported sick with the same condition on the same side. Excision of the gland was done, and the patient discharged fit.

The following are the points of interest in these cases:—

1. The sudden occurrence of three cases of salivary calculus within the short space of two months—and confined to British troops only.

2. The difficulty experienced in locating, and removing the calculus.

3. Simple incision within the mouth, with drainage, sufficed to abate all symptoms of the disease.

4. Radiological findings were positive in one case only.

5. Even when all evidence of calculi are removed it is not possible to forecast a cure. Excision of the gland was necessary to cure two of the three cases.

6. All three cases were of the submaxillary type.

My grateful thanks are due to the Officer Commanding, the British Military Hospital, Trimulgherry, and to the Surgical Specialist, for their kind permission to publish these notes.

### A CASE OF AMOEBI ABSCCESS OF LIVER.

By P. ARUNACHALAM, M.D.

*Assistant to the Second Physician, King George's Hospital, Vizagapatam.*

BHADRI, a Bhairagi, male, Hindu, 35 years, was admitted into the King George's Hospital, Vizagapatam, on 21st October, 1929, for amoebic abscess of the liver, duration two months. The liver was considerably enlarged, the lower border being 10 inches from



the right nipple in the nipple line. The patient's temperature was between 99° and 102°F. for two days after admission. He was given injections of emetine hydrochloride one grain each for nine consecutive days. The general condition improved remarkably and the local pain and tenderness were considerably less, but, as the liver showed no signs of any diminution in size and it was feared that the abscess might burst into the peritoneal cavity, it was decided to aspirate the liver. Major F. J. Anderson, M.C., F.R.C.S., I.M.S., aspirated the abscess on 6th November, 1929, and 81 ounces of thick "pus" were drawn out. The patient has been doing quite well since.

### AN UNUSUAL FRACTURE.

By R. P. WELDON.

Chief Medical Officer, Assam-Bengal Railway Co., Ltd.,  
Chittagong.

THE following seems to be a sufficiently rare accident to be worthy of record:—

Miss X., aged 39 years, was thrown from her horse and fell on hard dry ground paddy stubble. She felt severe pain in the right shoulder and right side. She was conveyed to the Railway Cottage Hospital, Chittagong, and was seen by me immediately on her arrival.

From the marks on the clothing, it was evident that the right side of the head, the right shoulder and to a lesser extent the right side, had come into more or less violent contact with the ground.

The pain in the shoulder was most marked at the root of the neck posteriorly. Movement of the shoulder caused pain and there was complete inability to raise the right arm to shoulder level.

Examination revealed fractures of the fifth and sixth ribs on the right side, but no fracture or dislocation of the arm or shoulder girdle could be palpated. The fractured ribs were strapped in the usual manner and she was put to bed.

Next day, as the pain in the shoulder was still acute, a skiagram of the shoulder girdle was taken. The film showed a fracture of the first rib at the junction of the posterior and middle thirds.

Recovery was uneventful, but full movement of the arm was not established for five weeks.

Fractures of the first rib are rare. It appears probable that in this case the fracture was caused by direct violence against a stone or hard lump of earth.

### QUININE "ADDICTION."

By S. C. NAG,

In-Charge Barbheel T. E. Hospital.

Borgang P. O. Tezpur, Assam.

CASES of cocaine or opium habit are not rare in general practice, but those of quinine habit are perhaps exceptional. The writer, however, has seen in his 19 years' practice two cases in which quinine rendered the users so much addicted, that they only gave up the habit with much difficulty. The histories are given below:—

*Case 1.*—Mrs. B., age 28, wife of a revenue officer, said to have suffered from chronic malaria, following her attending physician's advice, had regularly taken a 5-grain quinine tablet with tea between 3 and 4 p.m. once daily for a few months. Once there was no quinine tablet in stock and the lady could not take the daily dose for 3 or 4 days with the result that on each of these days, about an hour after quinine was due but

was missed, the lady experienced headache, and uneasiness, the cause of which was wrongly attributed to a slight malarial attack. Thereafter another supply of quinine tablets was procured, which the patient again took regularly as before, for about a year. When these tablets were all consumed the patient again had none to take for a couple of days with the result that shortly after the usual time at which quinine was due but was not taken, the lady felt so much headache and uneasiness that she could not look after her domestic affairs. This time also the trouble was attributed to malaria excited by failure to take quinine.

Then the writer was consulted and something to eradicate the "supposed" malaria was asked for. A report from the family physician and a detailed history of the case disclosed that the lady had had no malaria for about a year, and that quinine was continued during this period not only as a preventive measure, but also because the patient did not feel well without it. Though I found it difficult to attribute a cause to headache and uneasiness, I advised the lady to stop quinine. This she did with the effect that, after about a week's suffering from headache and uneasiness daily at the same time of day, the lady did not feel any more inconvenience.

*Case 2.*—K. C. S., male, aged 40, sought the writer's advice for the sense of depression with feverishness, headache and chilliness, experienced within an hour after missing the daily doses of quinine, which had been taken in 5 gr. doses (in tablet form) twice daily with tea—once between 8 and 9 a.m. and once between 5 and 6 p.m.—for a period of about four years, as a malaria preventive, according to a friend's advice. He said that during the first year of this quinine course he did not feel worse for the occasional omission of quinine, but from the second year he experienced the above trouble whenever he failed to take the drug. The history of the case at once reminded me of the case of the lady reported above, and I told him to stop quinine and not to apprehend trouble from omitting the drug. Accordingly he stopped quinine, and, though for the first two weeks or so he was much inconvenienced, he felt no trouble after that period.

### SCIRRHUS CANCER OF THE BREAST IN THE MALE.

By CAPTAIN MOHD. AJMAL HUSAIN, P.C.M.S.,

Assistant Surgeon, King Edward Memorial Hospital,  
Karnal.

S. HINDU male, aged about 60 years, resident of Karnal District, was admitted to the King Edward Memorial Hospital, Karnal, on 23rd March, 1930, with a fungating growth of the right breast about the size of a medium-sized orange. Duration—about one year, rapidly growing for the last 3 or 4 months. The skin over the growth was very thick and adherent. The growth was almost stony hard in consistency, and slightly moveable over the deeper structures. The glands in the axilla were palpable and hard in character.

*Provisional Diagnosis.*—Scirrhous cancer of the breast.

*Operation.*—Under chloroform, complete amputation of the breast with the portion of the pectoralis major underlying and adherent to the growth, as well as removal of enlarged lymphatic glands, was carried out.

*Examination of Growth.*—The Bacteriologist to the Punjab Government reported the microscopic appearances as a typical scirrhous carcinoma.

*Result.*—Healing by first intention ensued except in the centre of the line of incision to the extent of about an inch, in which area the edges are gaping probably due to the tension of the flaps. This area is healing by granulation.

The writer of this note is indebted to Dr. A. F. J. D'Arcy, Civil Surgeon, Karnal, for kindly suggesting and permitting him to send these lines to the *Indian Medical Gazette*.

## Indian Medical Gazette. .

JUNE.

### THE CHOLERA BACTERIOPHAGE.

MANY hard things have been said about Bengal, but no accusation hurts us quite so much as one which we know, or at least suspect, to be true. Whenever cholera is mentioned sanitarians the world over point the accusing finger at Bengal. There may be other endemic foci of the disease, there is almost certainly one in Indo-China, but the historical epidemics have all been traced to Bengal. The facts are very difficult to deny. Whenever there is an outbreak of cholera in any other part of the world, or even of India, it may last a few months, or even a year or two, but eventually it completely disappears, whereas in Bengal month in and month out cholera is with us; it would in fact be quite safe to say that on every day in every year somebody in Bengal dies of this disease. What is the reason for this? Many have been suggested. Some observers claim that it is entirely due to the peculiar climatic conditions, others blame the religious customs of the people, and yet others consider that it is due to the existence of a large number of carriers. However, recently, there has been a general agreement that it is probably due to a combination of a number of factors: the climate, which is undoubtedly favourable to the extracorporeal existence of the vibrio, the habits of the people, washing in tanks and then drinking the water, the existence of a large number of carriers and the frequent pilgrimages which disseminate the infection both within the province as well as outside it. In a *Memoir of the Indian Journal of Medical Research*, just published, Dr. d'Herelle, Major Malone and Dr. Lahiri have given another theory for this endemicity.

To understand this theory it is necessary to know something of the natural history of the cholera vibrio, more especially regarding its reaction to the bacteriophage. The authors in this memoir have not run any risk with their readers and the first part of the memoir would constitute an excellent primer in the study of bacteriophage. Not only are the nature and the mode of action of the bacteriophage described in detail, but throughout numerous examples are given to demonstrate each step in the theory of bacteriophage as applied to the cholera vibrio. The virulence of a vibrio, or of any other micro-organism for that matter, may be considered as its power to secrete a proteolytic enzyme, which has the power of making

the body tissues (the intestinal mucous membrane in this case) fit for assimilation by the micro-organism. This virulence may be lost in one of two ways, (a) through disuse, in which case the loss is usually incomplete, and is in any case not permanent, or (b) by mutation following the action of the bacteriophage on a virulent strain of vibrio; in the latter case the loss of virulence is apparently permanent. When a vibrio remains outside the body tissue for any length of time, either in nature or *in vitro*, it tends to lose its virulence and if ingested might give rise to no symptoms, or at the most to a vibronic diarrhoea, but after passage through one or two persons its virulence would be regained to its fullest degree. In every human intestine there is present an ultra-microscopic organism, the bacteriophage, which parasitizes the normal bacteria of the intestine, but when the intestine is invaded by the cholera vibrio this bacteriophage is capable of adapting itself to parasitization of the new invader; the rapidity with which this occurs depends on the conditions present in the bowel, slight alkalinity for example favours the bacteriophage whereas acid retards its development. So that when a person is attacked by cholera one of three things occur: (i) the bacteriophage fails to adapt itself sufficiently quickly, the multiplication of the vibrio is unchecked, and the patient dies of the disease; (ii) the bacteriophage multiplies rapidly, completely overcomes and destroys the cholera vibrios and the patient recovers; or (iii) the bacteriophage attacks the vibrio but, although not completely destroying it, modifies its character to such an extent that it undergoes mutation and becomes avirulent and again the patient recovers. The vibrios that have undergone mutation d'Herelle and his co-workers refer to as degenerated vibrios and they claim that under ordinary circumstances they never recover their virulence, that is the mutation is irreversible. In the test tube these avirulent vibrios can be produced by the action of a suitable bacteriophage on a vibrio culture; under these conditions they are referred to as secondary cultures. Under the insanitary conditions under which most of the victims of cholera live, the patient who dies disseminates virulent cholera vibrios, but the patient who survives disseminates bacteriophage adapted to parasitization of the cholera vibrio, as well as in some instances avirulent cholera vibrios; thus as the epidemic progresses some of the persons, who ingest cholera vibrios, have previously been infected by the bacteriophage already adapted to parasitize the cholera vibrio; in such persons the bacteriophage has a fair start, it almost invariably defeats the vibrio, consequently as time goes on the recovery rate in an epidemic increases, and finally when the whole population is infected with the specific bacteriophage the epidemic comes to an end. At this stage if the water supply

in the vicinity is examined it will be found to contain a large number of vibrios, these are avirulent and non-agglutinating, or only agglutinating in a very low titre.

Now, according to d'Herelle and his co-workers, the difference between the endemic and the non-endemic, or epidemic, areas is that whereas in the latter the degenerated vibrio never regains its virulence and therefore the disease disappears until it is again re-imported by an infected person arriving in the locality, in the former for some reason or other the degenerated vibrio regains its virulence. They suggest that at the bottom of the ubiquitous tank in Bengal lies the secret to the problem of the endemicity of cholera. At what this secret is they only guess; they suggest that in the intestines of some aquatic animal, annelid, crustacean or mollusc, the degenerated vibrio is capable of regeneration.

The authors of this memoir not only produce an entirely new theory regarding the epidemiology of cholera, but they are very destructive in their criticism of old theories and practices. In some cases their arguments are very convincing, as for example in their condemnation of the practice of permanganating wells; they point out that unless this is done much more thoroughly than it is done in actual practice, it does not destroy the vibrios present, that whenever a well is permanganated the people do not use it but use instead water from any tank or stream in the locality which is often far more highly polluted, that permanganate tends to kill the bacteriophage which would normally help to end the epidemic, and finally that it is a very unpopular measure which tends to make the people averse to all other sanitary measures; also in their criticism of the carrier theory of the spread of the disease which is dependent on one single, and according to them fallacious, observation made by Greig in Puri. On the other hand their summary dismissal of Rogers' hypertonic saline treatment with the remark, that the results appear to be better in the Campbell Hospital than in the European Presidency General Hospital in Calcutta (a statement which requires confirming, as we seem to remember being told by one of the officers working in the Presidency General Hospital at about the time Dr. d'Herelle was in Calcutta that they had treated successfully 33 consecutive cases of cholera); their contention that no immunity is produced in cholera and that therefore vaccination is probably useless; and the contempt with which they appear to treat the suggestion that climate can play any part in determining cholera endemicity and epidemicity, all seem to suggest that they have approached the subject with a somewhat prejudiced mind.

Their recommendations for prophylactic measures naturally consist in treating wells

and water supplies with bacteriophage; they can be summarized in their own words as follows:—

"The number of villages in which we have been able to apply the method of collective prophylaxis by bacteriophage is certainly not large enough for any definite conclusions regarding its absolute efficacy to be drawn; nevertheless it appears that these experiments tend to demonstrate it.

This method can only be applied in villages where cases of cholera occur because the bacteriophage disappears rapidly when there are no vibrios present at the expense of which it can reproduce. The method would, however, be applicable to threatened villages before cases actually occur but it would be necessary to distribute cultures of non-agglutinable vibrios isolated from carriers at the same time as cultures of bacteriophages so as to allow the bacteriophages to multiply in the intestine of the inhabitants. Such a practice would be without danger and the proof is that in all the villages when an epidemic has ceased, as well as in villages which have remained free from the disease, non-agglutinable vibrios as well as bacteriophages are found in the wells. It could not, therefore, be dangerous to reproduce experimentally conditions which occur naturally in populations which are free from the disease or which have become resistant.

In a town with a pipe water supply where an epidemic breaks out cultures would naturally be poured into the reservoirs to ensure the dissemination of the bacteriophage."

The memoir is an important one and should be read carefully by both bacteriologists and sanitarians in India. They will all, we feel sure, find some of the arguments convincing, the remainder stimulating. The study of the bacteriophage is in its infancy, and theory regarding it occupies a very important place. In support of each theory the writers give one, at least, and often many, examples, but this does not convince the scientist. The fact that in ten fatal cases of cholera ultra-pure, that is bacteriophage-free, cultures of vibrio were obtained means nothing to him; what he wants to know is out of 100 fatal cases of cholera from how many would an ultra-pure culture of vibrios be obtained. The impression that one gets is that there are no exceptions and that everything works exactly to plan. The experienced research worker knows that in actual practice this never occurs, and so after reading this memoir he is rather liable to feel that his intelligence has been insulted. In its exposition of the theory of the bacteriophage the memoir is rather more of a "primer" as we have already said, than a treatise, but after all that is probably what the authors meant it to be.

L. E. N.

## SPECIAL ARTICLES.

## GYNÆCOLOGY AND TROPICAL DISEASES IN SHAKESPEARE.\*

By V. B. GREEN-ARMYTAGE, M.D., F.R.C.P. (Lond.),

LIEUTENANT-COLONEL, I.M.S.,

Professor of Midwifery and Gynæcology, Calcutta Medical College, and Surgeon to the Eden Hospital for Women, Calcutta.

TWO YEARS ago I had the honour of speaking to this Society of the medical lore found in the Bible. To-night I am hoping to interest you in some aspects of medicine portrayed by Shakespeare.

I expect that most of you are aware that books have been written suggesting that the Bard of Avon was lawyer, soldier, courtier, gardener or astronomer, and yet, such was his genius, that I hope almost to persuade you that he was a doctor.

In the thirty-six plays mention is found of practically all the diseases and drugs known in this time, and in *Troilus and Cressida*, V. i., you will find a long list of such ills as the flesh was then heir to. But quite apart from such record, it is astounding to discover the wonderful knowledge of physiology, pathology, and psychology to which the plays bear witness. Let us acclaim him in his own words "How noble in reason, how infinite in faculty, in apprehension how like a god."

William Shakespeare was born on 23rd April, 1564, and died on the anniversary of his birth in 1618, that is twelve years before Harvey published to the world his momentous discovery of the circulation of the blood. But it should be remembered that for thirty years the poet was mixing constantly with the keenest brains of the realm, both in and out of London on his theatrical tours, and that that was the glorious Elizabethan age when merchant venturers, fired by the voyage of Hakluyt and "the new map with the augmentation of the Indies" (*Twelfth Night*) were seeking trade facilities with the distant West and East.

Surely then it needs but little imagination to picture the returning wanderers in the convivial company of Shakespeare and his player friends at the Mermaid, exchanging their tales of courts, courtesans and countries.

Those were the days of the Renaissance of Medicine as of Art, when such famous men as Fallopius, Vesalius, Fabricius, Columbus and Montanus had begun scientific dissection of the cadaver, and it is by no means improbable that Shakespeare heard of these men, or saw engravings of their discoveries in some London printing house with which he was in close touch throughout his life. Nor, in assessing his knowledge of medicine, must it be forgotten that his eldest daughter Susannah married Dr. John Hall in 1607, and that therefore some of his wealth of clinical observation may be attributed to this close association with one of the profession, although the greater number of his plays were written before that date.

In the thirty-six plays, seven regular physicians are mentioned but, be it noted, no surgeon, except it be that Dick Surgeon in *Twelfth Night*, who was so intoxicated that he could not attend his duties. You will remember the lines

"Didst see Dick Surgeon, sot?"

"Oh, he's drunk Sir Toby, an hour ago, his eyes, were set at eight in the morning. He's a rogue."

At that time, besides physicians licensed to practise by the College of Physicians or Company of Barber Surgeons, there were a host of quacks, both male and female, allowed by Act of Parliament in 1543 the liberty to practise, "if they had knowledge and experience of the nature of roots, herbs and waters, and of the operation of the same." As instances of these, you will remember Dr. Pinch in *The Comedy of Errors*, Friar Laurence in *Romeo and Juliet*, the female water

caster in *Twelfth Night*, Helena in *All's Well that Ends Well*. It is possible that Shakespeare also put Dr. Caius in *The Merry Wives of Windsor* in this category, for when the learned doctor boasts of his surgical skill and threatens to remove the testicles of Sir Hugh Evans for interfering with his love affairs, he is dubbed "belly stale," "a Castalian King Urinal" and "Monsieur Mockwater," though I must say I have a liking for that one small meed of praise he earns from the innkeeper.

"Shall I lose my doctor? No, he gives me the potions and the motions."

## Early Marriage.

Before speaking of tropical medicine, it will perhaps be convenient to illustrate the poet's knowledge of gynecology.

In Elizabethan times, as in India to-day, early marriage was the rule rather than the exception, but it is obvious that the dangers thereof were recognised, for in *Romeo and Juliet*, I. iii., speaking of Juliet, Capulet says to Paris:—

"My child is yet a stranger in the world.

She hath not seen the change of fourteen years,

Let two more summers wither in their pride,

Ere we may think her ripe to be a bride."

To which Paris replies:—

"Younger than she are happy mothers made" and Capulet retorts

"And too soon marred are those so early made."

And in the next scene Lady Capulet says to Juliet:—

"We'll think of marriage now,

Younger than you are made already mothers,

By my count, I was your mother much upon these years,

That you are now a maid."

## Quickening.

There are two references to this, one in *Love's Labour Lost*, V. ii.:—

"Faith, unless you play the honest Trojan, the poor wench is cast away, she's quick, the child brags in her belly already, she's yours."

And the other in *A Comedy of Errors*, I. i.:—

".....till my factor's death, Drew from me the kindly embracements of my spouse

From whom my absence was not six months old

Before her-self, almost fainting under the pleasing

Punishment that women bear, became a joyful

Mother of two goodly sons,

And which was strange, the one so like the other

As could not be distinguished but by name."

Obviously a case of uniovular twins.

## Longings of Pregnancy.

The only mention of this condition that I can find is rather a quaint one in II. i.:—*Measure for Measure*,

"Sir, she came in great with child, and longing, save your honour's reverence, for stewed prunes. Sir, we had but two in the house, in a fruit dish, a dish of some three pence, your honours have seen such dishes, they are not China dishes, but very good dishes."

These lines would appear to indicate that regular traffic with the East was quite usual in 1608 when this play was written.

## Parity of Ages in Husband and Wife.

In 1582 Shakespeare married Anne Hathaway who was eight years his senior. The marriage, judging by the bard's absences and his will, cannot be considered a happy one; you will remember that all he left her was his second best bed.

I think he nicely points the physiological moral of their disparity in ages in those lines in *Twelfth Night*, II. iv., which were written in 1600:—

"Too old by heaven. Let still the woman take

An elder than herself, so wears she to him,

So sways she level in her husband's heart,

For boy, however we do praise ourselves,

Our fancies are more giddy and infirm

Than woman's are."

\* A paper read before the Medical Section of the Asiatic Society of Bengal on 20th January, 1930.

*Death of the Fetus.*

Or its macerated retention *in utero*—probably due to syphilis—is put forward by *Henry VIII*, II. iv., as an excuse for his divorce from Katherine of Aragon:—

"Who hath commanded Nature that my lady's womb,

If it conceived a male child by me, should  
Do no more offices of life to it than  
The grave does not to the dead; for her male issue  
Ere died ere they were made, or shortly after  
This world had aired them."

And in *Henry VI*, Part 3, IV. iv., Queen Elizabeth bemoans the disastrous effect of acute emotion upon the child within her, in the lines:—

"Fair hope must hinder Life's decay,  
And I the rather wean me from despair  
For love of Edward's off'ring in my womb,  
This is it that makes me bridle passion,  
And bear with mildness my misfortune's cross,  
Lest with my sighs or tears I blast or drown  
King Edward's fruit, true heir to England's crown"

Of course I need not remind you that the idea of the infant being born as the poet says:—

"Full of displeasing blots and sightless stains,  
Lame, foolish, crooked, swart, prodigious,  
Patched with foul moles and eye offending marks—  
as a result of pre-natal influence still holds to-day though we are unaware of any scientific explanation

*Premature Birth.*

That premature birth may occur from the rolling of a ship, will be of interest to many mothers proceeding home from India, for it is described in *Pericles*, III. i.:

".....Lucina, O  
Divinest patroness and midwife gentle,  
To those that cry by night, deliver thy deity  
Aboard our dancing boat, make swift the pangs  
Of my queen's travails."

And in *A Winter's Tale*, II. ii., fear and grief at being cast into prison causes Queen Hermione to have a precipitate and premature labour:—

"How fares our gracious lady?"  
"As well as one so great and so forlorn  
May hold together, on her frights and grief,  
Which never tender lady hath borne greater,  
She is something before her time delivered"

*Toxæmia of Pregnancy.*

Although the line I am going to quote was not written with reference to conception, it so beautifully gilds the picture of a woman pregnant, with anxiety and sickness, that I feel compelled to make use of it, for who in India has not seen the sallow icteric face of the unwilling mother. The line is from *Troilus and Cressida*, I. iii.:—

"What grief hath set the jaundice on your cheeks"

*Labour.*

The references to difficult labour are interesting to us for as I pointed out in my former address, there are very few instances in the Bible of dystocia, and but of two deaths following confinement, the one from exhaustion and the other probably from inversion of the uterus or post-partum hæmorrhage. But as I then remarked, this absence of any record of difficult labour is what one would expect of primitive people living active, healthy, nomadic lives. Conditions were probably much the same in country districts and among the well-to-do of Merrie England, so perhaps we should not expect sweet Master Shakespeare to mention difficult labour. If death in child-bed were common, it is hardly likely, considering the enormous wealth of medical lore he gives us, that he would have omitted to make use of the fact in one or other of the plays.

On the other hand, this is perhaps surprising when we remember that rickets, one of the commonest causes of dystocia, existed in the crowded areas of the larger towns in the poet's time, for within 60 years of his death, the first authenticated description of rickets, *alias* the "English disease" was written by Dr. Glisson.

In *Henry VIII*, V. i., the agony of Anne Boleyn at the birth of the future Queen Elizabeth of England is described:—

".....the Queen's in labour,  
They say in great extremity, and feared  
She'll with the labour end."

And in contrast it is rather amusing in the last lines of the same scene to observe the disgust of His Majesty when he was told by the garrulous old lady that he had a daughter:

"As like you as a cherry is to cherry."

It is of interest to note that in *Henry VI*, Part 3, V. vi., the birth of Gloucester is described as ill-omened and difficult in the lines:—

"Thy mother felt more than a mother's pain,  
And yet brought forth less than a mother's hope,  
To wit, an indigested and unformed lump."

And later in the same scene we are told in his own words that he was a footling presentation and born with teeth:—

"For I have often heard my mother say  
I came into the world with my legs forward,  
The midwife wondered, and the women cried  
'O Jesus bless us he is born with teeth,'  
And so I was. Which plainly signified  
That I should snarl and bite and play the dog."

Again, it would appear from *Richard III*, IV. iv., that not only does the poet describe the birth of Gloucester as difficult, but it looks as if it was a case of oligoamion and that this was the cause of the deformities, for we read in *Henry VI*, Part 3, III. ii., the words:—

"She did corrupt frail nature with some bribe,  
To shrink mine arm up like a wither'd shrub,  
To make an envious mountain on my back  
Where sits deformity to mock my body,  
To shape my legs of an unequal size,  
To disproportion in every part."

Moreover it would seem that it was recognised that the fetus could be deformed or strangled by morbid conditions *in utero*, for we have the lines in *Richard III*, IV. iv.:—

"Oh, that she might have intercepted thee  
By strangling thee in her accursed womb."

Which would suggest strangulation by the umbilical cord.

*Cæsarean Section.*

There seems little doubt that this operation was well known and talked about in the days of Shakespeare, for not only are there two actual references in the plays, but an expression is used metaphorically in *King John*, V. iii., which would indicate that his audience was well acquainted with the operation. The lines are:—

"You bloody Neros, ripping up the womb  
Of your dear mother England, blush for shame."

And although Shakespeare may have had "little Latin and less Greek," it is quite probable that he had heard of those lines in *Ovid* (*Metam. Lib.*, 2. 1. 630):—

*Nature flammis uteroque parentis,  
Eripuit geminique tulit Chironis in antrum.*

Which indicate that Aesculapius was cut from his mother's womb. Perhaps you will let me remind you of the story, that Coronis, the mother of the unborn Aesculapius by Apollo, was killed by Artemis for unfaithfulness. Her body was about to be burnt on the pyre, when Apollo snatched the boy from his mother's womb (and the flames) and carried him to the cave of the wise Centaur Chiron, who instructed him in the cure of all diseases, and so he became the great god of medicine to the Greeks.

The operation is of great antiquity, and I think it is to the credit of the Church of Rome that it popularised and countenanced it in mediæval days, doubtless in the teeth of violent hostility. Mr. Herbert Spencer tells us that we owe the title "Cæsarean Section" to a Jesuit priest Theophile Raynaud, who published a

memoir in 1637 entitled *De ortu infantium contra naturam per sectionem Cæsaream tractatio*. Anyhow it can safely be assumed that the popular idea which labels Julius Cæsar as being the first living result of the operation is erroneous, for historically we know his mother lived long after his birth, and had rumour or tradition of such an operation surrounded him, surely Plutarch would have mentioned it and Shakespeare touched upon it in his play. As a matter of interest, it is possible that the word Cæsarean is a play upon the Latin verb *cædo*.

Mr. Herbert Spencer tells us that the first authentic record of Cæsarean section, with the recovery of mother and child, is by Bauhinus. The operation was performed by a sow gelder, Jacob Nufer of Siegershausen, who, after thirteen midwives and several lithotomists had failed to deliver or relieve his wife, decided to operate with a razor *non secus quam porco*. The child lived to the age of 77, the mother recovered and later was delivered of twins, and four other children were born naturally after them. So you see, even in those days "once a Cæsarean, did not mean always a Cæsarean."

The question now arises, whether in his plays Shakespeare refers to the classical operation, or to post-mortem Cæsarean section for you remember that in *Macbeth*, V. vii., the Thane of Glamis boasts:—

"I bear a charmed life, which must not yield  
To one of woman born."

To which Macduff replies:—

"Despair thy charm,  
And let the angel whom thou still hast served  
Tell thee, Macduff was from his mother's womb  
Untimely ripp'd."

To my mind, the interpretation of these lines is that the mother of Macduff perished prematurely or in labour, and, in obedience to the edicts of Holy Mother Church, the baby was cut from her womb.

Again, in *Cymbeline*, V. iv., we have the lines:—

"Lucina lent me not her aid,  
But took me in her throes,  
That from me was Posthumus ripp'd  
Came crying 'mongst his foes,  
A thing of pity."

This, together with the lines in I. i.:—

".....for which their father  
Then old and fond of issue, took such sorrow  
That he quit being, and his gentle lady  
Big of this gentleman, our theme, deceased  
As he was born. The king he takes the babe  
To his protection, calls him Posthumus Leonatus."

Would seem to leave no shadow of doubt that the poet infers post-mortem Cæsarean section, from the play upon the name Posthumus, and the word ripp'd, cf. *eripuit* in the lines of *Ovid*.

#### The First Cry of the Infant.

I feel that many a mother in the anxious moments immediately following child birth, when the baby's life is in doubt, will appreciate the lines in *King Lear*, IV. vi.:—

"Thou know'st the first time we smell the air  
We wawl and cry,  
When we are born we cry that we are come  
To this great stage of fools."

#### Lactation.

It is interesting to read that Juliet was not weaned until she was three years old. The poet states that the nurse had to put wormwood on her nipples in order to wean the child:—

"When it did taste the wormwood on the nipple  
Of my dug, and felt it bitter, pretty fool,  
To see it tetchy and fall out with the dug."

Despite the prolonged lactation, Juliet does not appear to have been very rickety, for in the same scene we read:—

"For then she could stand alone, nay be the rood  
She could have run and waddled all about."

#### Sterility.

In mediæval times there existed, as there does in India to-day, a belief in the efficacy of charms and erotic flagellation for the cure of this condition. In *Julius Cæsar*, I. ii., Shakespeare makes use of Plutarch's description of the feast Luperalia, in order to remedy Calphurnia's sterility. Let me quote you the passage from Plutarch:—

"In those days many young noblemen and magistrates ran up and down the city with their upper garments off, striking all they met with thongs of hide by way of sport, and many women, even of the highest rank, placed themselves in the way and held out their hands to the lash, as boys in school do to the master, out of the belief that it procures an easy labour for those who are with child, and makes those conceive who are barren."

I'm sure you will like that reference to the boy and his schoolmaster written in A.D. 100, and will wish that there were more of this nowadays in our schools.

The lines of Shakespeare are:—

"Forget not in your speed Antonius  
To touch Calphurnia, for our elders say  
The barren, touched in this body chase  
Shake off their sterile curse."

#### Aphrodisiacs.

Throughout the ages much trust has been placed in the doubtful efficacy of such substances. For instance, in *The Merry Wives of Windsor*, V. v., we have the invocation of Falstaff:—

"Let the sky rain potatoes, let it thunder to the tune of Green Sleeves, hail kissing comfits, snow eringoes, let there come a tempest of provocation, I will shelter me here."

The potato of that time was the sweet potato, *Convolvulus battatus*, which like the eringo (sea holly) had the reputation of being able to restore decayed vigor. Of course I need not remind you that our potato of to-day is the *Solanum tuberosum*, and with tobacco, was originally brought from Virginia by Sir Walter Raleigh.

It may interest some of you to know that the tune of Green Sleeves is an old ballad entered at Stationers' Hall in 1580, the words and tune of which are still extant.

Again in *Othello*, I. i., Brabantio infers a secret knowledge of aids to concupiscence when he says:—

"Are there not charms,  
By which the property of youth and maidenhood  
May be abused. Have you not heard, Roderigo,  
Of some such thing?"

And later he accuses Othello of influencing Desdemona:—

"Thou has practised on her with foul charms,  
Abused her delicate youth with drugs, or minerals  
That weaken motion."

#### Midwives.

References to midwives are numerous, and it is probable that Shakespeare was thinking of these women when he wrote in *Twelfth Night*, IV. iv.:—

"Carry his water to the wise women."

But it would appear that the "wise women" were like Dickens' Sarah Gamp, too prone to liquid refreshment, for in the same play II, v., Marcius says:—

"Nay, but say true, does it work upon him?"

And Sir Toby answers:—

"Like *aqua vitæ* on a midwife."

The midwife of those days apparently exhibited a trait perhaps not altogether obsolete to-day, loquacity, but alas, with us the punishment does not fit the crime. For instance, in *Titus Andronicus*, IV. ii., because she was "a long tongued babbling gossip," the midwife was murdered in order to stay the evidence of illegitimacy in her patient!

But against this, there are those lines in *Romeo and Juliet*, I. iv., referring to Queen Mab as the fairies' midwife:—

"This is the hag, when maids lie on their back  
That presses them, and learns them first to bear,  
Making them women of good carriage."



*Medico-Legal.*

Apart from the reference in *The Winter's Tale*, II. ii., where Paulina asseverates the law of all countries of all times, that a woman pregnant cannot suffer capital punishment, in the lines:—

"This child was prisoner to the womb and is  
By law and process of great nature, thence  
Freed and enfranchised, not a party to  
The anger of the king, nor guilty of  
If any be, the trespass of the queen."

There is the claim of Joan of Arc in *Henry VI*, Part I. V. v., exemption from execution, on the plea of pregnancy:—

"I am with child, ye bloody homicides  
Murder not then the fruit within my womb,  
Although ye hale me to a violent death."

It is only fair to Shakespeare's memory to state that eminent modern scholars doubt whether he was the author of the above episode in this play. They aver that the original manuscript was tinkered with, and its author accepted the idle rumours of her enmity against the Maid, just as we accepted the most amazing reports about the Germans in the Great War. For if you will read Andrew Lang's masterpiece *The Maid of France*, you will see that there is irrefutable evidence produced of her austere chastity throughout life, and you will recall her last piteous appeal:—

"Alas will they treat me so horribly and cruelly  
and burn my body, that never was corrupted, and  
consume it to ashes this day."

Although not strictly relevant to gynaecology, it is a curious fact that the poet should allude in *Cymbeline*, I. iv., to animal experimentation for the purpose of discovering the potency of drugs. Perhaps he had read, or heard of the experiments of the perfidious Caesar Borgia, for in the same play he describes the effects of chronic arsenic poisoning.

"A mortal mineral, which being took should by  
the minute, feed on life, and lingering, by inches  
waste you."

Of acute arsenic poisoning, he gives a vivid description in *King John*, V. vi.

There are several other references to poisonous drugs in use at that time, for instance the line in *Hamlet*, IV. vii.

"I have bought an unction of a mountebank"  
would seem to indicate curare, whereas the words I

"With juice of cursed hebenon in a vial"  
must mean hemlock (*Conium*) which you will remember Socrates died of. The lines in *Macbeth*, I. iii.,

"Have we eaten of the insane root  
That takes the reason prisoner"  
refers of course to Henbane (*Hyoscyamus*)

"which if it be eate or dronke, it breedeth madness  
or slow likeness of sleepe."

Personally, speaking of drugs, the line that I like best is that appeal of Cleopatra to Charmian

"Give me to drink mandragora,  
That I might sleep out this great gap of time  
My Anthony is away."

Though perhaps Iago's description in *Othello*, III. iii., is almost as fine

"Not poppy nor mandragora,  
Nor all the drowsy syrups of the world,  
Shall ever medicine thee to that sweet sleep  
Which thou ow'dst yesterday."

It may interest you to know that Mandragora or Mandrake, was the antispasmodic that Reuben gave to Leah, and which was so helpful to Rachel in *Genesis*, XXX, 14.

And Reuben went in the days of wheat harvest and found mandrakes in the field, and brought them unto his mother Leah. Then Rachel said to Leah.

"Give me I pray thee of thy son's mandrakes."  
"And Jacob slept that night with Leah and she conceived." And later also "Rachel conceived."

*Diseases met with in the Tropics.**Malaria.*

In the low-lying and undrained areas of England, malaria was more or less endemic in the days of Shakespeare, consequently it is not surprising to find in his plays numerous references to this disease. The general opinion in those days—which held till the discoveries of Laveran and Ross, was that malaria arose from inhaling the miasma of sun warmed swamps, for in the *Tempest*, II. ii., Caliban says

"All the infections that the sun sucks up  
From bogs, fens, flats, on Prosper fall  
And make him by inchmeal a disease."

and again in *Julius Caesar*, II. i.

"Is Brutus sick, and is it physical to walk  
unbrae'd, and suck up the humours  
Of the dark morning."

To dare the vile contagion of the night,  
And tempt the rheumy and unpurg'd air,  
To add unto his sickness"  
and in *King Lear*, II. iv.

"..... infect her beauty  
You fen sucked fogs, drawn by the powerful sun  
To fall and blast her pride."

Further, in *Timon of Athens*, IV. iii.

"O blessed breeding sun, draw from the earth  
Rotten humidity, below thy sisters orb  
Infect the air."

The various clinical types of fever are recognised in several places. For instance in *Henry V*, II. i., Dame Quickly speaks of Falstaff as

"So shaken of a burning quotidian, that it is most  
lamentable to behold."

In *Richard II*, II. i., we read of the death of John of Gaunt

"presuming on an ague's privilege"

also in *Julius Caesar*, I. ii., we have reference to the rigor, pallor, and wasting after malaria in the lines

"When the fit was on him I did mark  
How he did shake, his coward lips  
Did from their colour fly,  
And that same eye did lose his lustre, I did

hear him groan

And that tongue of his, alas it cried  
Give me some drink, Titinius."

also in II. ii.

"Caesar was ne'er so much your enemy  
As that same ague which hath made you lean."

In *The Tempest*, III. ii., the delirium of malaria is described

"He is in his fit now, and doth not talk  
after the wisest"

and in *As You Like It*, III. ii., there is that beautiful metaphor

"He seemed to have the quotidian of love upon  
him, he that is so love shak'd."

It is interesting to note that in *Troilus and Cressida*, III. iii., Shakespeare recognised that an attack of ague might be precipitated by exposure to the sun—insolation—for we have the lines

"And danger, like an ague subtly taints  
Even then when we sit idly in the sun."

*Plague.*

There are innumerable allusions to the plague, for it must be remembered that in the poet's day the City of London was rarely free from this disease. In the various references to the pestilence, it is difficult at times to know whether the poet inferred bubonic plague or typhus, for both diseases were equally common and may frustrate diagnosis even to-day. For instance, in *Coriolanus*, IV. i.

"Now the red pestilence strike all trades in  
Rome, their occupations perish."

and in *The Tempest*, I. ii.

"The red plague rid you for learning me  
your language"

and in *Troilus and Cressida*, II. i.

"A red murrain on thy jades tricks"

and in iii.

"He is so plaguey proud, that the death tokens cry 'No recovery.'"  
Whatever the actual disease, it is obvious that it was then recognised as being very infectious, for in *Twelfth Night*, I. iv., we read

"Even so quickly may one catch the plague"  
and in *Richard II*, I. iii.

"Suppose devouring pestilence hangs in our air,  
And thou art flying to a fresher clime."

In this connection it is of great interest that Shakespeare should refer to two methods of treatment which were as common then as they are in the East to-day, for in *Coriolanus*, III. i., we read of segregation in the case of infectious diseases

"Pursue him to his house lest his infection,  
being of catching nature, spread further."  
whereas in *Romeo and Juliet*, V. ii., infected individuals are forcibly interned in their own house

"..... the searchers of the town  
Suspecting that we both were in a house  
Where the infectious pestilence did reign,  
Sealed up the doors and would not let us forth."

Finally, while speaking of quarantine, perhaps you will allow me to quote Shakespeare's dear thought of England and his appreciation of our island home being segregated from the external world, in those lines from *Richard II*, II. i.

"This fortress built by nature for herself,  
Against infection and the hand of war."

#### Dysentery.

There are but few allusions to this malady, which considering the many scenes of camps and battle, is perhaps remarkable, but there is the following line in *Titus Andronicus*, III. i.

"My bowels cannot hide her woes,  
But like a drunkard must I vomit them"  
and in *Troilus and Cressida*, II. ii.

"No lady of more softer bowels, more spongy  
to suck in the sense of fear."

I have often wondered why some modern pill vendor, or patient with chronic constipation has not adopted Hamlet's words

"For this relief, much thanks."

#### Anæmia.

We have noted the pallor which the poet associated with malaria, but it is obvious that he had observed chlorosis, or secondary anemia of women, as a thing quite apart from the same condition in men, for in *Twelfth Night*, II. iv., we have those beautiful lines

"..... she never told her love  
But let concealment like a worm i' the bud  
Feed on her damask cheek, she pined in thought  
And, with a green and yellow melancholy,  
She sat like patience on a monument  
Smiling at grief"

and in *Romeo and Juliet*, IV. i., the still more beautiful lines

"The roses in thy lips and cheeks  
Shall turn to paly ashes."

Whereas in *Henry IV*, Part 2, IV. iii., Falstaff refers to male green sickness in words which are, I think, of particular interest to us in Bengal.

"For thin drink doth so overcool their blood, and making many fish meals they fall into a kind of male green sickness, and then when they marry they get wenches. They are generally fools and cowards, which some of us should be, but for inflammation."

And in *Anthony and Cleopatra*, III. ii., we read  
"And Lepidus is troubled with the green sickness."

#### Consumption.

First we have those lovely lines in *A Winter's Tale*, IV. iii., which are so peculiarly applicable to the zenana world of India

"..... pale primroses  
That die unmarried, ere they can behold  
Bright Phoebus in his strength, a malady  
Most incident to maids."

and then, in *Troilus and Cressida*, V. iii., the wasting of consumption, as possibly complicating syphilis or malaria is described

"A whoreson ptisick, a whoreson rascally ptisick so troubles me, and I have such an rheum in mine eyes and ache in mine bones, that unless a man were cursed, I cannot tell what to think on it"

again, in *A Lover's Complaint* we find a reference which may be construed to mean the fetid breath of the consumptive.

"Oh, that sad breath his spongy lungs bestowed."

#### Hydrophobia.

It is obvious that this was well known to follow the bite of a rabid dog, for in *The Comedy of Errors*, V. i., we have the lines

"The venom clamours of a jealous woman,  
Poison more deadly than a mad dog's tooth."

#### Pyorrhœa.

I expect most of you are aware that the modern tooth brush came into fashion about 1700. Prior to this little care was taken of the teeth except perhaps the occasional use of the stick customary in India to-day. It is however probable that caries was rare in those days because of breast feeding, a full vitamin diet and the scant use of knife and fork, but there can be little doubt that pyorrhœa did exist, for we have the lines in *Coriolanus*, II. iii.,

"Bid them wash their faces and keep their  
teeth clean,"

and in *Julius Cæsar*, I. ii., Casca says  
"The rabblement uttered such a deal of  
stinking breath."

Moreover you will remember in *The Merry Wives of Windsor*, Falstaff speaks of "kissing comfits," which refers to a custom of taking perfumed cachous to sweeten the breath, a habit referred to in *Romeo and Juliet*, I. iv.

"Because their breaths with sweetmeats tainted are."

In the epilogue to *As You Like It*, it would appear that halotitis was unpleasantly common in Elizabethan days, for Rosalind says,

"If I were a woman, I would kiss as many of  
you as had breaths that I defied not."

Finally we have those caustic lines in the 130th Sonnet which Mr. G. B. Shaw observes is such anathema to women,

"And in some perfumes is there more delight,  
Than the breath that from my mistress reeks."

#### Syphilis.

There are so many references to this malady under various titles such as "the French disease," the "rotten disease of the South," "the Neapolitan disease" that I need not detail them, except perhaps in the interests of syphilographers to say that the most arresting are to be found in *Hamlet*, V. i., *Measure for Measure*, I. ii., *Henry V*, II. ii., and *Timon of Athens*, IV. iii.

#### Incontinence of Urine.

You are all aware that this is a condition often seen in children and prostatic old men, but perhaps not many of you know that Shakespeare mentions the fact—which is corroborated by Ben Jonson in his play *Everyman in His Humour*, and is vouched for by the Hon. Robert Boyle,—that it is proverbial that the music of the bagpipes has the power to produce enuresis. Here are the lines in *The Merchant of Venice*, IV. i.

"Some men there are that love not a gaping pig,  
Some that are mad if they behold a cat,  
And others, when the bagpipes sing i' the nose  
Cannot contain their urine."

Ben Jonson's lines are

"What ails thy brother? Cannot he hold his  
water at the reading of a ballad?"

"Oh no, a rhyme to him is worse than cheese  
or a bagpipe."

*Goitre.*

Shakespeare, living in Stratford, must have seen many cases of Derbyshire neck which was doubtless as common then as it is in the Darjeeling hill tracts to-day. Therefore I am sure these lines in *The Tempest*, III. iii., will appeal to you

"Who would believe that those were mountaineers,  
Dewlapp'd like bulls, whose throats had hanging  
At them wallets of flesh."

*Pruritus.*

It is obvious that scabies was known and its cause understood, for in *Romeo and Juliet*, I. iv., we have the reference

"Not half so big as a round little worm,  
Prick'd from the lazy finger of a maid"

and again in *The Tempest*, II. ii.

"Yet a tailor might scratch her where'er she  
did itch  
and in *Coriolanus*, I. i., Marcius says

"What's the matter, you licentious rogues, that  
rubbing the poor itch of your opinion, make  
yourselves scabs."

*Diagnosis by the Appearance of the Urine*

This is probably one of the very oldest methods of diagnosis, and as you are aware it still exists in the East amongst Ayurvedies and the followers of the Baghbat. In Shakespeare's time this custom was called "water casting," and there are many references to it throughout the plays. Perhaps the best known occurs in *The Two Gentlemen of Verona*, II. i.

"These follies shine through you like water in a  
urinal, that not an eye that sees you but is a physician  
to comment on your malady."

*Diet.*

I feel sure that my Hindu and vegetarian friends will feel complimented by the lines in *Twelfth Night*, I. iii.

"I am a great eater of beef, and I believe  
that does harm to my wit  
to which Sir Toby feelingly replies

"No question about it"  
but they should mark well the words of Longaville in *Love's Labour Lost*, I. i.

"Fat paunches have lean pates, and dainty bits  
Make rich the ribs, but bankrupt quite the wits"

On the other hand, in *Julius Caesar*, I. ii., the folly of asceticism is described as follows,

"Let me have men about me that are fat,  
Sleek headed men and such as sleep o' nights.  
Yon Cassius has a lean and hungry look,  
Such men are dangerous."

In *The Comedy of Errors*, V. i., there is good advice for doctors and students, who as you know, due to hurried and irregular meals, are prone to suffer from indigestion and duodenal ulcer, for it is written

"Unquiet meals may give you indigestion."

and in *Macbeth*, III. iv.

"Let good digestion wait on appetite, and  
health on both."

For those who are romanticists I like the words of Speed in *The Two Gentlemen of Verona*, II. i.

"Though the chameleon love, can feed on air I am  
one that am nourished by my victuals, and would  
fain have meat."

To show you in India, Shakespeare's appreciation of the importance of a clean milk supply, surely there is nothing to equal Launcelot's remark in III. i., of the same play,

"She can milk, look you, a sweet virtue in a  
maid with clean hands."

Speaking of public health, it is of more than ordinary interest to find that even so long ago as the days of Shakespeare, flies were looked upon as carriers, for in *Romeo and Juliet*, III. iii., we have those beautiful lines

"..... more courtship lives  
In carrion flies than Romeo, they may seize  
On the white wonder of dear Juliet's hand  
And steal immortal blessing from her lips.  
Flies may do this, when I from this must fly."

*Alcohol.*

Merrie England in the days of Shakespeare was well noted for its beer drinking propensities, vide *Othello*, II. iii., but it is doubtful whether the mead and hop grown beer did much harm. The poet-actor-manager lived in convivial times, therefore it is a pleasure to read in *Henry VIII*, I. iv.

"Good company, good wine, good welcome,  
Can make good people"

but I think our Scotch and American friends respectively will appreciate the lines in *Othello*, II. iii.

"Come lieutenant, I have a stoup of wine."

"Not to-night good Iago, I have a very poor and unhappy brain for drinking. I could well wish courtesy would invent some other form of entertainment"

but I doubt if even a Scotsman would accept the advice of Falstaff in *Henry IV*, Part 2, IV. iii.

"If I had a thousand sons the first human principle I would teach them, would be to forswear a thin potation and addict themselves to sack."

*Mental Disorders.*

Nothing illustrates the genius of William Shakespeare as well as his reading of the mind with the causation and development of mental diseases. To those who are particularly interested I may refer them to the book of Dr. John Bucknill published in 1867 on *The Mad Folk of Shakespeare*. For our purpose it will be sufficient to remind you that "Othello" and Julius Caesar suffered from epilepsy, which in the latter play Brutus calls "the falling sickness."

In *King Lear*, II. iv., we have the curious reference to *hysterica passio*, and in *Troilus and Cressida*, II. iii.

Ulysses describes the symptoms of Achilles in words which seems to indicate his disease as incipient general paralysis of the insane.

The tragedies of Macbeth and Hamlet portray a knowledge of psychological medicine without parallel in literature, and those of you who have had occasion to be called to such a case, will appreciate the words of the canny Scotch doctor in *Macbeth*, III. i.

"This disease is beyond my practice, I think but  
dare not speak, more needs she the divine than the  
physician."

as he discreetly tries to pass her on to the confessional. Moreover, I like to think that that same canny doctor perhaps originated the Rule of the Commissioners of Lunacy that we should record a patient's own words as evidence of mental instability, for you will remember he says

"I will set down what comes from her to satisfy  
my remembrance the more strongly."

There seems little doubt that Shakespeare foreshadows the principles of modern psycho-analysis in those famous lines

"Canst thou not minister to a mind diseased,  
Pluck from the memory a rooted sorrow,  
Raze out the written troubles of the brain  
And, with some sweet oblivious antidote  
Cleanse the clogg'd bosom of that perilous stuff  
Which weighs upon the heart"

and I feel that the authorities of all mental hospitals will rejoice that the proper treatment of mental diseases can be credited to his genius, for in *Much Ado About Nothing*, V. i., we read

"Fetter strong madness in a silken thread,  
Charm ache with air, and agony with words."

There are many other references to melancholia and mania in the plays, for instance in the *Comedy of Errors*, and *King Lear*, but it is worthy of note that the poet urges the physician to be sanguine even in the

most anxious moments, for in *Love's Labour Lost*, V. ii., we read

"Your task shall be with all the fierce  
endeavour of your wit,  
To enforce the pain'd impotent to smile"

for

"The miserable have no other medicine,  
But only hope."

Finally, there are those wise lines in *King Henry IV*, Part 2, III. i., which to my mind are so apposite to the state of politics in England and India to-day,

"Then you perceive the body of our kingdom  
How foul it is, what rank diseases grow  
And with what danger near the heart of it"

to which Warwick answers

"It is but as a body yet distempered,  
Which to his former strength may be restored  
By good advice and little medicine."

If one reads Shakespeare earnestly one realises how prophetic he is and how nearly he touches existence and customs to-day. For instance, I think he must have foreseen the modern jazz band for, although he frequently speaks of music as a remedy, he is equally emphatic that as a soothing agent it may have an opposite effect. In *Richard II*, V. v., he writes

"This music mads me; let it sound no more;  
For, though it have help madmen to their wits,  
In me, it seems, it will make wise men mad."

Again, he foresees modern late hours and overeating and describes an excellent remedy. Here are the lines in *Henry IV*, Part 2, IV. i.

".....We are all diseased  
And, with our surfeiting, and wanton hours,  
Have brought ourselves into a burning fever,  
And we must bleed for it"

Again, perhaps we owe the modern waistless line of women to Shakespeare, for we read the words of Queen Elizabeth in *Richard III*

".....Ah! cut my lace asunder,  
That my pent heart may have some scope to beat."

However, it is nice to read in *The Comedy of Errors* that Dr. Pinch had a good bedside manner. The line reads

"Give me your hand and let me feel your pulse."  
And the description of a lady's voice

"Her voice was ever soft,  
Gentle and low, an excellent thing in woman."

Although the poet seems to appreciate the effect of the recent festive season in the line

"For my voice I have lost with hollaing and  
singing of anthems"

it is obvious that Shakespeare was well aware of the benefits of fresh air, for we read such lines as

"The most wholesome physic of thy health  
giving air."

"The air is quick and it pierces and sharpens  
the stomach."

"There's fresher air my lord in the next chamber,  
Lead in your ladies."

Finally, let us not forget those words

"Our remedies oft in ourselves do lie,  
Which we ascribe to Heaven."

The poet's estimation of a patient's gratitude is as true to-day as three hundred years ago.

"Blow, blow thou winter wind,  
Thou art not so unkind  
As man's ingratitude."

But, remember he does not overestimate the help of medicine, for we read

".....I consider  
By medicine life may be prolong'd, yet death  
Will seize the doctor too."

#### Prognosis.

It is said of Sir William Osler that he never saw a patient, however desperately ill, without leaving behind him an atmosphere of hope. The same idea is to be found in *Anthony and Cleopatra*, II. v.

"Though it be honest, it is never good  
To bring bad news"

for we read in *Henry IV*, Part 2, I. i.

"He that but fears the thing he would not know,  
Hath by instinct, knowledge from others eyes  
That what he feared, is chanced."

It is worthy of note that the poet well understood the importance of the previous history of adjudging disease, for in *Henry IV*, Part 2, III. i., we read

"There is a history in all men's lives  
Figuring the nature of the times deceased,  
The which observed, a man may prophesy  
With a near aim, of the main chance of things  
As not yet come to life."

Gentlemen, the time allotted me is coming to an end, and you remember what Lord Say remarked in *Henry VI*

"Long sittings to determine poor men's causes,  
Hath made me full of sickness and diseases."  
Nevertheless, I trust you will not think of me as  
"A fellow of infinite jest and most excellent fancy"

who

"waxes desperate with imagination,"

but rather believe that

"My endeavour has been  
To frame your mind to mirth and merriment,  
Which bars a thousand harms, and lengthens life"

and so

"Give me commendation for my free  
entertainment."

I know I have but touched upon the fringe of this great subject and my thesis is but a thing of "shreds and patches," but if I have awakened fresh interest in the world's greatest poetic genius, I shall consider myself sufficiently rewarded.

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#### THE VALUE OF MEDICAL SOCIETIES.\*

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#### LADIES AND GENTLEMEN,

It is my first and pleasing duty to offer you my cordial thanks for the honour you have done me by electing me to be your president during the ensuing year. It is an honour which I deeply appreciate, but when I accepted it I was not aware that the duties of the office embraced the delivery of a presidential address, but the Council has recently decided to add this new feature to the agenda of our annual meetings. I must therefore bow to its decision—and at the same time crave your indulgence whilst I endeavour to fulfil the duty imposed upon me. The subject upon which I propose to address you is the value of medical societies. Of societies in general, whose number is legion, I do not propose to speak. All no doubt perform useful services in greater or less degree, but there are peculiar features attaching to medical societies which render them, with due regard to the limitations

\*The presidential address delivered before the Punjab Branch of the British Medical Association on 9th March, 1930.

imposed by circumstances, perhaps of greater value than any other societies of a similar nature.

Perhaps the first and most important aim of a medical society is educational. Medical science, which is the lineal descendant of that daughter of Aesculapius named Panacea, is so wide a subject, the problems which it embraces are so complex, our knowledge of disease is at once so large and yet so incomplete, our means and our methods of restoring the sick are so constantly changing, that of no learned profession more than ours can it be said, with greater truth, that our education is never complete.

But Aesculapius had another daughter whose name was Hygieia and from her is derived that branch of medical science which deals with the conservation of health. A science which embraces problems both of health and disease is therefore sufficiently abstruse and extensive; but that is not all, medicine is not only a science, but an art; it is not only a science and an art, but it is also, in some measure, a craft.

To be an expert in all branches of medicine is obviously impossible and the most we can hope to do is to keep abreast of the times in our own speciality and to learn something of what is going on in other branches of medical science. We however start our professional life under a severe handicap. It is obvious that no curriculum however long and no training however perfect can turn out graduates who are fully and for all time equipped to practice their profession. By the time we leave college we have merely learnt how to learn, but it is not easy to learn and at the same time to earn a living.

The habit of systematic reading has not always been acquired, time does not often permit of observations of scientific value being made under the conditions of every-day practice, and the tendency of the young practitioner to rest satisfied with the little knowledge he has gained at college, is strong. Who has not met doctors who call to mind Shakespeare's lines regarding

"The fashion of these times

"When none will sweat but for promotion

"And having that, do choke their service up

"Even with the having."

It is here where the medical society comes in. Much can be learnt from books and journals and from the study of cases, but the medical society offers a unique opportunity to the medical man of improving his knowledge at little or no cost and with the least possible effort to himself. Those in government service can, it is true, obtain study leave once or twice in their service and some form of post-graduate study is obligatory in most branches of government service, but the private practitioner is not so fortunate. He can rarely take leave, lest his practice takes leave of him.

To all members of the medical profession, and more especially to the private medical practitioner, the medical society is therefore a boon, if not a necessity. It is not merely the knowledge acquired by attendance at clinical meetings and demonstrations—though it may be considerable—that has to be taken into account, but the fact of being an active member of a medical society tends to keep the mind of the doctor receptive and to prevent him from adopting an attitude of complacency towards his professional attainments.

It was these considerations that promoted some of us a few years ago either to form a new medical society in Lahore or to resuscitate the Punjab Branch of the British Medical Association. The latter seemed the easier course and, thanks largely to the active interest and support of the Principal and staff of the King Edward Medical College, and more especially of the devoted labours of Lieut.-Col. Harper Nelson, our indefatigable Secretary, the Punjab Branch of the British Medical Association can claim to be one of the most flourishing and most active branches of the association in existence. But, gentlemen, have we done enough? Lahore is only one city in the Punjab—and in the *mofussil* the lump of medical science burns none too brightly. Divisions ought to be formed in other cities, more especially in Amritsar and Ludhiana where there are medical schools. We might, too, publish our

transactions, in which not only the scientific papers read at our fortnightly and other meetings might be published, but also other matters of local interest to the profession.

The functions of a medical society are however not merely educational. By the very nature of things medical men, engaged in private or consultant practice, are involved in a more or less intense struggle for existence—a circumstance which too often leads to strife and personal animosities. Sometimes the trouble is due to misunderstandings, sometimes to ignorance, sometimes to pettiness, and at others to less venial causes. But too often the result is that the unity of the profession is compromised and its interests jeopardized. In such circumstances it may well happen that a chance meeting in the neutral atmosphere of a medical society may lead to explanations and reconciliations. Here, too, an opportunity is afforded of establishing those personal relationship and friendships, which appear to be the best method of solving the communal problem, which in medicine, as in other walks of life, is a grave handicap to progress.

Another function of a medical society is to promote the honour and corporate interests of the profession, but here let me tell a story and sound a note of warning. An Englishman, a Frenchman and a German were once asked to contribute to the literature of the elephant.

The Englishman selected as his title:—

"Elephants I have shot, with an appendix on the ivory trade."

The title selected by the Frenchman was:—

"Samson, The amours of an elephant."

The German, in collaboration with 27 friends, produced 6 bulky tomes in 24 parts with the title:—

"A Handbook on Elephants in Health and Disease. Their History, Life, Death and Metaphysical Implications, with some account of the Giraffe and the Rhinoceros."

I do not know what title an Indian would have selected, but in the year of grace 1930, I apprehend it may have taken the form of:—

"The Elephant considered as a politically minded animal, with special reference to its employment in twisting the British Lion's tail."

Gentlemen, the story, like every good story, conveys a moral. The moral is that there is no place for politics in a well-conducted medical society. I do not wish to suggest that politics should be eschewed entirely, but I do hold that a medical society should not degenerate into a political arena and that its political activities should be confined to actions calculated to promote the unity, honour and interests of the profession.

This surely must be our guiding principle. It is, indeed, obvious that, in the absence of a spirit of concord and unity, it is not possible to build up a strong and independent medical profession.

Medical science recognises no boundaries, political, topographical or ethnological, and its votaries must seek knowledge from whatever quarter it may be obtained. For this reason the tendency, which has recently become prominent, to adopt an attitude of isolation must be regarded as a grave error.

Englishmen, Americans and others go to Moga to sit at the feet of Rai Bahadur Dr. Mathra Das—and Indian practitioners would surely be well advised to maintain, socially and scientifically, a close relationship with all that is progressive in the scientific world. "In essentials unity, in non-essentials, liberty—and in all things charity" is not a bad motto for a medical, and, indeed, for many other societies. It seems to me, therefore, that those who seek to divide the profession and destroy its unity are doing no good to themselves and an ill-service to their country, whilst those who are working to make the Indian medical profession strong and self-sufficient are the only true "independence-wallahs" amongst us!

Gentlemen, this address has already been sufficiently long, but before I conclude let me refer briefly to one

more respect in which medical societies, and for that matter all societies, are worthy of our active support.

The success of any society is in large measure dependent upon its office bearers and upon those who devote their time and energy, by giving lectures or demonstrations, to promoting the objects of the society.

This work—voluntary and unpaid—is often considerable, but when it is undertaken in the public interest, when private advantage is subordinated to the public good, surely then it may be said that it blesses him who gives as well as him who receives. The medical society may therefore be said to promote the spirit of social service, which in its broader aspects implies good citizenship.

To conclude, I have placed before you in barest outline the varied functions—educational, social and ethical—that medical societies subserve. I have done so not because I have anything novel or original to say, but because I feel, at this particular juncture, it may be conducive to the honour of the profession and the interest of this country to emphasize the important values for which a well-conducted medical society stands.

## Medical News.

### ASSOCIATION FOR THE PREVENTION OF BLINDNESS IN BENGAL.

*Inaugural meeting held at Government House, Calcutta.*

AN inaugural meeting for the formation of the Association for the Prevention of Blindness in Bengal was held at Government House on 26th March, 1930, at 6 p.m. under the presidency of the Hon'ble Lady Jackson. Among those present were:—

The Hon'ble Sir George Rankin.  
The Hon'ble Maharajah Sir P. C. Tagore.  
The Hon'ble F. A. Sachse, Esqr.  
The Hon'ble Sir C. C. Ghosh.  
The Hon'ble Mr. Justice D. N. Mitter.  
Mrs. F. V. Rushforth.  
Mrs. Cottle.  
Lieut.-Col. D. P. Gail, I.M.S.  
Lieut.-Col. W. L. Harnett, I.M.S.  
Lieut.-Col. E. O'G. Kirwan, I.M.S.  
Dr. C. A. Bentley.  
Dr. H. Subrawardy.  
Dr. T. Ahmed.  
Dr. A. K. H. Pollock.  
Dr. Kedar Nath Das.  
Dr. T. N. Majumdar.  
Dr. Rai Haridhona Dutt Bahadur.

The meeting opened with an address from the Hon'ble Lady Jackson in which she stated:

"Ladies and gentlemen:

This meeting has been called to inaugurate an Association for the Prevention of Blindness in Bengal.

You are all aware that the terrible calamity of blindness is very prevalent in this country, but many of you probably do not know that a large percentage of cases could have been prevented by simple treatment in the early stages, and that many others can be cured by suitable operations and other forms of treatment. The object of this Association will be to spread the knowledge that blindness is preventable and curable and it is hoped that this will be done by methods of education, by practical demonstration and eventually by means of travelling hospitals and dispensaries. Colonel Kirwan will explain to you the chief causes of blindness and will indicate the lines upon which the Association should attack the problem.

We hope to form a strong committee which will be able to carry out the objects for which we are holding this inauguration meeting to-day. I shall now call on Colonel Kirwan to read a paper on Blindness in India."

Following the address Lieutenant-Colonel E. O'G. Kirwan, I.M.S., read a paper on Blindness in India in course of which he said:

"It is not generally known to what an extent blindness prevails in India. The medical man only sees the cases who come to him for operation or treatment. He does not see the vastly greater number of people suffering from eye diseases who do not avail themselves of medical assistance, due to ignorance, apathy or poverty."

"For India the figure of totally blind persons in the census returns showed an incidence of about 1½ per thousand. The population of Bengal is 46½ millions and the incidence of total blindness is 0.7 per thousand, but the returns for the compilation and application of vital statistics are inaccurate and unreliable. It is no exaggeration to say that the true ophthalmic picture of India should be represented by figures showing 1½ millions of totally blind persons and 4½ million persons with more or less impaired eyesight. No one who has not worked in India could form any conception of the enormous amount of preventable and curable blindness which overshadowed the health, happiness and usefulness of the country." "It is little realised" continued the speaker "how many of the blind of all ages are capable of cure and to what an extent blindness is preventable. Blindness for the most part is preventable if the people are sufficiently educated to adopt simple precautions and to avail themselves of medical assistance, even when this would involve some trouble and a little expense."

"Blindness amongst Europeans in India and educated Indians is rare. The Indian peasant fails to realize the danger of eye complaints which if neglected may lead to blindness even when medical facilities are near at hand, and will often fail to avail himself of them, and when, for a complaint which he may regard as trivial, he has to travel many miles and to a distant dispensary, it is not a matter of surprise that he remains in his village and suffers the consequences of his neglect. Government hospitals and dispensaries may be well attended by patients for various complaints and may be very popular, but for eye diseases, the number who will attend constantly and regularly is very small compared with the frequency of these complaints."

The speaker went on "The Indian public prefers medical facilities brought to their very doors, and many eyes are destroyed by the travelling quack who visits the villages and persuades the trusting patients to submit to his unskilled operations. In large centres there are many excellent clinics and hospitals where skilled treatment is obtainable, but in country districts and villages skilled advice is unobtainable except by long distance journeys which the poor cannot afford, and so the quack visits the villages and finds ready victims who place their trust in him only to find that their plight has been made worse than before."

The broad lines on which a campaign for the prevention of blindness should be conducted were stated thus:

"1. Preventive work against ophthalmia neonatorum in cities in collaboration with municipal authorities and to extend the work to villages.

2. To find out the blind and to bring the benefits of modern surgery to them; in part at least this might be done by travelling ophthalmic surgeons and by financial assistance to the poorer sufferers to enable them to attend eye hospitals.

3. By establishing ophthalmic dispensaries in each district.

4. The system of health visitors who would visit and encourage the people to send the afflicted to hospitals for treatment early before their sight is lost."

Next Colonel Kirwan compared the condition of Egypt to that of India as regards blindness and its prevention and showed what good can be achieved by small beginnings.

The speaker concluded by quoting Lieut.-Col. R. E. Wright, I.M.S., of Madras, "intensive propaganda work is urgently required. Money spent in this connection would be better spent than in establishing institutions for the blind (i.e., training schools, homes, etc.), which



although humane in intention, is beginning at the wrong end. The support of propaganda efforts has up to now been unenthusiastic."

A resolution, as follows, was then moved by the Hon'ble Maharajah Prodyot Coomarr Tagore, seconded by Mr. T. D. Edelston and was carried unanimously.

#### Resolution:

"That a Society be formed under the patronage of the Hon'ble Lady Jackson to be called the Association for the Prevention of Blindness in Bengal and the same to be registered under the Societies Registration Act 1860, with a Memorandum of Association and rules in accordance with the draft now submitted."

The Hon'ble Mr. F. A. Sachse proposed that the following be appointed Officers of the Committee of the Association:

#### President:

The Hon'ble Sir George Rankin, *Kt.*

#### Vice-Presidents:

Sir R. N. Mookerjee, *K.C.I.E., K.C.V.O.*

Sir Onkar Mull Jatia, *Kt.*

#### Members of the Committee:

Mrs. M. R. Mehta.

Mrs. M. L. Mitra.

Mrs. F. V. Rushforth.

T. D. Edelston, *Esqr.*

Dr. C. A. Bentley, *C.I.E., D.T.M. & H., D.P.H., M.B.*

Dr. H. Subrawardy, *O.B.E., M.D., F.R.C.S.I., D.P.H.*

#### Honorary Treasurer:

Capt. A. E. Ker, *v.c.*

#### Honorary Secretary:

Lieut.-Col. E. O'G. Kirwan, *F.R.C.S.I., I.M.S.*

The resolution was seconded by Dr. Kedar Nath Das and was carried unanimously.

## HEALTH IN THE TROPICS.

### THE RESPONSIBILITY OF EMPLOYERS.

THE Director of the London School of Hygiene and Tropical Medicine, Sir Andrew Balfour, gave a lecture and cinema demonstration at the School, on the 26th February, 1930. Brig.-Genl. Sir Samuel Wilson, the Permanent Under Secretary of State for the Colonies, was in the Chair, and there was a large attendance, fully representative of industrial organisations with interests in tropical countries. The lecture was intended as an introduction to the next course of lectures given at the School on Tropical Hygiene for men and women outside the medical profession taking up life in the tropics. This course is given in a series of eight lectures of one-and-a-half hours each between March 12th and 21st, and other courses will be given at regular intervals. Full particulars can be obtained from the Secretary of the Institution, at Keppel Street, Gower Street, W.C.1.

Sir Andrew Balfour in the course of his lecture said:—

"It is amazing the difference which good health makes to the tropical resident even if the climate be vile, the food unattractive and the conditions of life calculated to worry and annoy him.

"It is scarcely necessary to say that things have changed greatly for the better in the tropics since the mid-Victorian novelists used them as a background for their heroes, their heroines and their villains. Drinking habits have radically changed, the progress of civilization has effected a veritable revolution in many parts and, above all, research has thrown a flood of light into dark places and, together with experience, has taught us how to master and how to prevent disease.

"Just think for a moment what the last three-and-a-half decades have witnessed in the way of important and life-saving discoveries. The problem of malaria infection and transmission has been solved and this, in large measure, clears up the mystery which for so long a time shrouded the dreaded blackwater fever, for the

latter is now definitely known to be an expression of malaria—in other words it is a condition resulting from malaria infection.

"Yellow fever, that Yellow Jack which used to play havoc with the mercantile marine, sweeping away ships' crews and ruining trade, has been proved to be a mosquito-borne disease and so can, in most places, be readily controlled.

"Turning now to certain diseases which more especially attack the native, are in consequence foes to industry on the large scale and about which those who employ labour in the tropics should be fully informed, it is surely gratifying to realize that hookworm infection need no longer be the curse of the agriculturist.

"Here is a case in point, an extract from a letter sent by an employer to the Director, Medical and Health Department, Kenya Colony. It is culled from the *Kenya Medical Report for 1928*:

"I think that the following facts re my labourers (Wadigo) will interest you:

"Last year, and during the first six months of this year, the highest weeding and clearing task that I was able to get done by my labourers was 450 square yards per day, and this after infinite trouble. The task was done unwillingly and the men were sulky and appeared to me to be unfit to do a fair day's work.

"On the 13th May, 1928, as you no doubt remember, I took every man to your camp, where you gave them anti-hookworm treatment.

"At the present time these same labourers are doing a task of 1,000 square yards in heavier grass and bush and are doing it cheerfully."

"Quite apart from the advance in our knowledge of how to prevent and cure disease, physiological research has taught us a good deal about how best to live in hot climates—what type of house to build, what kind of clothes to wear, what kind of exercise to take and when and how to take it, what food and drink we should there consume for our benefit and comfort.

"These things being so it is amazing how many young men and women go out to posts in the tropics woefully ignorant of the A. B. and C. of tropical life. Too often they pay for this ignorance and, if so, they usually pay early in their careers, for experience teaches, but experience is apt to be a costly teacher. Nobody wishes to frighten the would-be tropical resident. Indeed, he can be assured that, apart from certain parasitic infections, he is unlikely to contract any of the more serious tropical diseases, for these find happy hunting grounds under conditions which the average European will not tolerate. Still some of the parasitic diseases such as malaria and dysentery are far from negligible and forewarned is forearmed. Furthermore a man can settle down much more quickly in the tropics and he is much happier and more comfortable there if he knows how to take care of himself and succeeds in avoiding infection, while, if he has to look after a labour force he will do so much more efficiently if he has some idea of how to safeguard its health and knows what are the dangers and difficulties which have to be avoided.

"It is surely essential to give the layman or laywoman destined for the torrid zone a chance to acquire that information which has been gained by careful and laborious work and which has wrought such a change in our tropical outlook. To me it seems almost criminal to withhold it, for I have seen time and again what I may call the tragedy of ignorance. I have seen a white missionary sitting in the smudge of a fire like any naked native to save himself from mosquito bites because he had not realized that in certain parts of Africa life after sunset is unendurable without a net.

"What is one to say of the tragic case of the foolish youth who finds in the company of some native woman a relief from loneliness and an outlook for his passions, and lives to regret for ever his lack of comprehension as to what this kind of cohabitation may mean both morally and physically?

"On employers there seems to me to rest a serious responsibility, while in any case a policy of neglecting to take advantage of any means whereby the health

of an employee may be conserved is beyond question shortsighted. If the first wealth be health in this part of the world, still more does health spell money in countries where the resident is in any case somewhat handicapped and where even minor maladies are put to assume dimensions to which they are strangers in more favoured climes.

"In the lectures given at this School that fact is borne in mind and the tropics are considered from several angles in an introductory address which has much to commend it. Then the student is warned how to prepare for his journey and for life in a hot country. He is advised as to outfit and various measures of prophylaxis, both before quitting England and during the voyage. Thereafter personal hygiene in the tropics is considered in all its bearings and he is given many "tips," the outcome of experience which cannot fail to be useful to him wherever he may happen to be stationed. Some of the commoner diseases of the tropics, especially those from which he may himself suffer, are then expounded and general measures of protection against tropical diseases are fully explained, including those which must be taken when camping out. A section deals with insects and other pests and the price of failure to cope with malign climatic conditions and disease is indicated in no uncertain terms. Finally, simple and explicit instructions in prevention and in first aid complete a course carefully adapted to the needs of the layman and calculated both to interest and benefit him.

#### THE OFFICE INTERNATIONAL D'HYGIENE PUBLIQUE.

THE following is an abstract from the report by Lieut.-Col. Phipson, D.S.O., M.D., M.R.C.P., I.M.S., delegate for the Government of India, on the session of the Office International d'Hygiene Publique held at Paris, October 21st to 30th, 1929.

The first plenary session was held at the premises of the Office at 3 p.m. on Monday, 21st October. Monsieur Velghe (Belgium) in the Chair. The President opened the proceedings by referring in sympathetic terms to the loss which the Committee had sustained in the recent death of Dr. H. M. Gram, delegate for Norway, and welcomed his successor, Dr. Wehring. He also extended a welcome to Dr. Shanin Pasha, delegate for Egypt, and the newly appointed members of the Committee. The full list of delegates is appended to this report. He then reviewed the general activities of the Office since the last session, and detailed the personnel of the five Commissions dealing with Smallpox, Quarantine, Opium, the Pilgrimage and Yellow Fever. As delegate for India I continued to serve on the last four of these.

In the following account of the work of the session I do not propose to follow the discussions which took place from day to day, but to summarise the conclusions of the conference and to indicate the general trend of the discussions.

*Item I.—Application of the International Convention of 1926 and questions connected with it—*

A. (i) *Report of the Egyptian Quarantine Board on the pilgrimage of 1929.*—The important report on this subject, presented by Major Gilmour, President of the Board, was considered and approved and the Committee recorded their appreciation of this valuable documentation. The Committee were further indebted to Major Gilmour for giving the delegates an opportunity of witnessing an interesting cinematographic film dealing with the work of the Quarantine Station at El Tor.

A. (ii) *The Pilgrimage.*—Major Gilmour's report and the general questions relating to the pilgrimage were examined by the Pilgrimage Commission under the Chairmanship of Sir George Buchanan. So far as could be stated from reports hitherto received, no important diseases other than smallpox and dysentery were prevalent in the Hedjaz during the period of the pilgrimage of 1929. The Commission noted the advantages in Syria, Palestine, Irak and Transjordan, as well as to the pilgrims themselves from

the Beyrout Conference and its association with the Regional Bureau, and it was suggested by the delegate for Egypt, that, in view of the happy results already achieved, it would be advantageous to consider the convocation, in the near future, of another conference of countries in the Near East, on the lines of the recent conference at Beyrout, at which it was hoped that Persia would participate, to consider the directions in which further progress might usefully be attempted, as for example the selection and regulation of pilgrim routes.

*Sanitary Control at El Tor.*—The Commission noted the cases of S.S. "Riad" and S.S. "Plata" referred to at page 48 of Major Gilmour's report, which afford an additional proof of the necessity for continual vigilance at El Tor and Kamaran with the object of detecting ships which fail to comply with the requirements of the International Sanitary Convention.

*Measures in the Red Sea.*—The communication from Dr. Atkey, delegate of the Soudan, was noted with interest. This dealt with improvements in the quarantine establishment at Suakim and in measures taken with regard to pilgrim traffic including the cessation of pilgrim transport by dhows and other sailing vessels. Dr. Lutrario, the Italian delegate, intimated that measures were being taken at Massawah to put an end to that form of transport as regards pilgrims from Erythra.

I was able to state that as far as Aden was concerned there is no mass transport of pilgrims from Aden to Jeddah otherwise than via Kamaran, but there are no doubt means of reaching Jeddah from the Hadramout by an indirect route without calling at Aden.

*Use of Kamaran Hospital accommodation for cases other than Plague or Cholera.*—In reply to a question by the Delegate of the Dutch East Indies, the Commission expressed its view that it was clearly the intention of the Convention of 1926 that suspected cases of smallpox on ships should be treated on shore at the Kamaran Quarantine Hospital, but that as regards diseases other than those specified in the convention, it was a matter which concerned the captain of the ship, the hospital authorities and the pilgrim himself. Regarding the pilgrimage from India, I informed the Conference that the Haj Enquiry Committee (under the Chairmanship of the Honourable Mr. H. B. Clayton) recently appointed by the Government of India, had begun its labours. It is not clear from the terms of reference of this Committee, whether such matters as sanitary passports for pilgrims will be considered by this Committee, but it would appear appropriate that the Government of India should give this matter their attention with a view to the establishment of a system of sanitary passports similar to that in force in all important countries with Mohammedan populations. In view of the apprehension with which traffic of all kinds from India is apt to be regarded in the international atmosphere of the "Office," it seems desirable that the Government of India should go as far as they can to meet what is evidently international feeling in the matter.

The question of sanitary passports for pilgrims was studied at the last session of the Office, and was again considered at this session. The consensus of opinion was then, and is now, that although a form of sanitary passport identical for all countries concerned with pilgrim traffic may be found impracticable, it is at least very desirable that all countries should have a system of sanitary passports for pilgrims, and that these documents should resemble each other as nearly as the particular requirements of each country will permit.

A. (iii) *Application of Article 28 of the International Convention of 1926.*—This subject assumed considerable importance owing to the divergence of practice in the interpretation of the article. The matter was discussed by the Quarantine Commission under the Chairmanship of Dr. Jitta (Holland) and the text of its report should be read in this connection.

A. (iv) *Use of Wireless Telegraphy in Quarantine Operations.*—On this subject the Quarantine Commission had before them a communication from the

Spanish delegate, and a comprehensive note by Dr. Philip Stock (Delegate for South Africa) including a draft Code of brief and practical questions, the answers to which are intended to be sent by wireless from ships not more than 12 hours or less than 4 hours before arrival in port, the message to be preceded by the code word "Moden" which has been provisionally allotted for this purpose by the International Code of Signals Committee. The note also included a copy of the Quarantine portion of the Draft Medical Section of the International Code of Signals. Dr. Stock's draft code was accepted by the Committee who emphasised that the adoption of such a system was manifestly to the advantage of shipping and of Port authorities, and would naturally facilitate quarantine operations, and expedite the granting of pratique. They reiterated, however, their former view that it could not be considered practicable to confer on ships, on the strength of a wireless sanitary declaration, any definite rights as regards pratique on arrival in port.

A. (v) *Ship's Doctors*.—This question is at present in suspense, and further communications are awaited from delegates of the countries concerned. The Committee propose to reinforce the action already taken by the Office by calling attention to the matter when issuing the "Report to Governments."

The question is already receiving attention by the British Government particularly as regards professional instruction for ships' surgeons, in the form of an optional diploma.

A. (vi) *Bills of Health*.—There is still but little unanimity on this subject though there is an evident tendency towards reduction of cost, and towards the suppression of consular visas.

A. (vii) *Sanitary Control of Aerial Navigation*.—On this important subject the Committee had the advantage of hearing an interesting statement made at the invitation of the Office by Monsieur Roper, Secretary-General of the International Committee of Aerial Navigation. He outlined the present position of aerial navigation and its future development, new and projected air-routes and air-ports, the development or direct wireless communication between aerodromes, and the working of the International Committee. Communications from the Japanese delegate, the delegate of the Belgian Congo and an important note by the Director of the Office were read and discussed at length. The possibility of the spread of cholera by the air-route from Karachi to Egypt and other countries was the basis of much discussion and, as delegate for India, I should have liked to be in a position to reassure the delegates more effectively than was possible with the information at my disposal, that the risk of spread of cholera was in reality very remote. Such material points as (1) the sanitary condition of the Karachi air-port and its situation with respect to the infected part of the city; (2) the category of passengers who use the air-route; (3) the absence of any dangerous communication between pilots and passengers arriving at Karachi preparatory to departure by air and the infected part of the city; (4) the water supply of the air-port and of Karachi hotels, and the nature of water supplied to aeroplanes before leaving such points presented on the basis of known rather than assumed fact would have gone far to reinforce the tendency of the majority of the delegates to regard the restrictive measures adopted against Karachi in Egypt and elsewhere, as hardly justified by the circumstances.

The Commission, however, considered that the subject was of such great importance that it was incumbent on the Office to study the matter in all its bearings by means of a special Commission of Aerial Navigation, which would meet before the beginning of the next Session and present its report at the meeting of the Office in May 1930. The Commission were further of opinion that no attempt should be made, in devising a sanitary code for aerial navigation, to assimilate it to the maritime code.

A. (viii) *Rat-guards*.—At the last session of the Office Dr. Park (Delegate for Australia) was invited

to prepare a report on this subject, and his report was considered, together with the communications from India by Dr. Chitre and Major Taylor and one from Dr. Rupert Blue, regarding a type of rat-guard in use in the Philippines by the Quarantine Commission which formulated certain conclusions, which were later adopted by the full Conference.

These were briefly as follows:—

(a) Rat-guards are only of use if suitably constructed and if the greatest care is used in applying them;

(b) The Commission does not recommend any standard pattern: Port authorities may employ either the cone or disc provided it is constructed in accordance with the principles laid down in the report of Dr. Park;

(c) The Commission hopes that the electric rat-guard devised by Major Taylor and Dr. Chitre, will be put to practical test under working conditions;

(d) The Commission has learnt with interest of the suggestion of Dr. Boye that strongly illuminated hemispherical guards might be effective, having regard to the well-known effect of glare and dazzle on the lower animals, and hopes that experiments may be instituted on these lines.

*Item II.—Opium Commission*.—The Opium Commission under the Presidency of Dr. Carriere reviewed the list of new products resulting from the combination of morphine with organic acids, and recommended that all preparations of this type should be examined with a view to their ultimate control.

*Item III.—Yellow Fever*.—On this subject there were several important papers for discussion; these included General Boye's paper dealing with yellow fever in French West Africa, Sir George Buchanan's dealing with British West Africa submitted on behalf of the Colonial Office, Dr. Van Campenhout's on prophylaxis, and on the 1928 outbreak at Matadi, and Dr. Barrand's paper dealing with the Yellow Fever problem as affecting India. Dr. Van Campenhout's views on Yellow Fever prophylaxis led to considerable discussion, particularly as regards transmission by aircraft. The Commission under the presidency of Colonel S. P. James after a full discussion, decided to summarise the present position as regards transmission of yellow fever in the form of seven provisional conclusions, which are of such importance that I translate them *in extenso*.

(1) The specific germ of yellow fever is still unknown.

(2) The disease spreads from man to man by the intermediary of *Stegomyia (Aedes) aegypti vel argenteus*. So far, the disease has never been known to develop outside regions where this species of mosquito is found.

(3) It is believed that in those countries in which yellow fever exists, the disease is maintained in an endemic form by abortive or mild cases, particularly among children and the indigenous population. These cases often pass unobserved. In the laboratory it has been demonstrated that certain species of monkeys are susceptible of being infected with the yellow fever virus, either by direct inoculation, or by the bite of an infected *Stegomyia*.

(4) In those countries in which yellow fever does not exist, the disease can only develop if it is imported:—

(a) By persons suffering from yellow fever. It is recognised that such persons cannot infect mosquitoes after the 3rd day of the illness.

(b) By infected mosquitoes. These mosquitoes only become infective between the 8th and 12th day following the ingestion of infected blood, but a mosquito once rendered infective, remains so for the rest of its life.

(5) Ordinarily, the incubation period of yellow fever is 3 or 4 days; it never exceeds 6 days.

(6) In devising measures to avoid the risk of transport of yellow fever, it is necessary to take into consideration the habits of the mosquitoes which transmit the virus. The breeding places of this mosquito are always found in the immediate neighbourhood

of houses and the adult mosquitoes very rarely quit the local area where they hatched out.

(7) The Committee draws attention to the fact that, in view of the accidents which have occurred in the course of laboratory researches on yellow fever, these researches, if carried out in countries which are free from yellow fever, but in which *Stegomyia* are present involve a real danger of the spread of the disease.

I would draw special attention to the last conclusion of the Committee, which is particularly applicable to India. The fact that the virus can be maintained in an active condition for several months and can be transported from place to place, coupled with the occurrence of unrecognised but presumably infective cases of yellow fever in laboratory workers suggests that if research on yellow fever is contemplated in Indian Laboratories, the most rigid precautions would appear to be necessary. It may be noted that the Dutch Government has already prohibited research on yellow fever in its territories except in certain laboratories in Holland.

It appears to me probable that the importation of yellow fever virus into India for research purposes is at present the only likely mode of introduction of yellow fever into India. There are at present no direct aerial lines of communication between the West African endemic areas and India and India is hardly threatened unless the East African seaboard is infected. Moreover, up to the present it is not known whether an infected *Stegomyia* can be transported long distances by aeroplane, or on board ships. The risk of introduction by human cases, owing to the limited period of infectivity in the human subject, may be negligible but the risk of introduction by infected mosquitoes, although remote, still remains a possibility, particularly in the event of the development of African transcontinental air-routes, owing to the persistence of infectivity in the infected mosquito. Research on the habits of *Stegomyia* in India and elsewhere in relation to aerodromes and aircraft, might throw light on this aspect of the matter.

**Item IV.—Cholera and Plague.—Cholera.**—The only communication of importance on the subject of cholera was the French translation of the work of d'Herelle, Malone and Lahiri in India which was well received. Dr. Shahn Pasha (Egypt) recalled the possibility of cholera from eating infected oysters.

**Plague.**—Communications were received from General Boye on the relation between pneumonic plague and temperature in Madagascar; from Dr. Tsurumi on the outbreak of Plague in Mongolia in 1928 an epidemic of septicemic plague without pneumonic manifestations or buboes, and from Dr. Columbani (Morocco) on the ambiguous results of anti-plague inoculation in an outbreak of plague in Morocco in April-June, 1929. The question of the efficacy or otherwise of anti-plague inoculation was the subject of general discussion, and I was able to record the experiences on this point in Aden in more detail and with more accuracy than was possible at the previous session, and the marked effect of inoculation on the incidence of the disease. The possibility of diffusion of plague by means of the human flea was discussed by Dr. Columbani (Morocco) and I brought to the notice of the Committee certain facts, tending to establish this mode of diffusion, which emerged from the Aden epidemic of 1928. Dr. Ricardo Jorge (Portugal) stated his conviction that certain limited epidemics of plague were undoubtedly due to transmission by the human flea.

**Item V.—Smallpox.**—There were several important communications on this head. Reports invited at the last session on the administrative aspect of smallpox were received from the delegates of Great Britain, Germany, Norway and Spain. I presented Colonel Graham's report on the smallpox epidemic in Aden in 1929, and Dr. Jitta (Holland) read a preliminary communication on the quite recent epidemic of smallpox

(alastrim) in Holland. The last paper lead to an interesting discussion.

The epidemic began by the importation of a mild case of doubtful nature, in the person of a sailor arriving in Rotterdam from the Dutch East Indies. This case led to an outbreak which after much discussion was first diagnosed as "alastrim" and all the official measures applicable to smallpox were not taken although vaccination was pressed from the beginning. Later on the advice of a commission it was decided that it should be termed "variola minor." Vaccinations to the number of 1,800,000 were carried out, and there were 95 cases of post-vaccinal encephalitis.

It is recognised that the question of post-vaccinal encephalitis is still acute and it is proposed to collect and correlate information received from all sources on this important matter. The delegates of Great Britain, Holland and Germany are invited to institute histological researches to determine whether the lesions of experimental vaccinal encephalitis in the rabbit are identical with the lesions of post-vaccinal encephalitis in the human subject. The Commission will study the effects of vaccination modified by (a) vaccination carried out with minimum damage to the tissues; (b) smaller doses of vaccine; (c) dilution of lymph, and (d) use of sterile or killed lymph.

**Item VI.—Tuberculosis.**—Communications were submitted by the delegates of Norway and Great Britain on tuberculosis from the industrial standpoint, and the administrative measures taken to combat it.

**Item VII.—Undulant Fever.**—The chief communication was Dr. Dalrymple-Champney's report, published by the British Ministry of Health establishing that only 14 cases of undulant fever originating in England have been reported, that on the other hand, contagious abortion in cattle is widespread and that examination of a group of nearly 500 unpasteurised milk-samples indicated that about 5 per cent. of the cows were excreting *B. abortus* in their milk. The report emphasises the importance of pasteurisation of milk, though this does not of course eliminate the risk from direct contact. In contrast to the comparative rarity of undulant fever in Great Britain is the position in Denmark, where Dr. Madsen states that 500 cases occur annually, with a mortality of 2-3 per cent. The prevalence, so far as it is not due to direct animal-infection, as in butchers, he attributes to the distaste of Danish people for boiled or pasteurised milk, though he was careful to emphasise that all milk and butter for export is pasteurised. The incidence in Switzerland, Sweden, America and Germany were discussed by the respective delegates. Investigations are proceeding in all these countries. There is a tendency to regard *Brucella melitensis*, *Brucella abortus* and the bacillus of Bang as variants of the same organism but the circumstances in which *B. abortus* infection in animals can cause undulant fever in the human subject remain obscure. All delegates were agreed on the extreme importance of pasteurisation of milk supplies as a prophylactic measure.

**Item VIII.—Acute Anterior Poliomyelitis.**—One report on this subject was presented by the French Ministry of Hygiene. Sir George Buchanan commented on the peculiar distribution of the disease in sparsely populated rural districts and pointed out that in the neighbourhood of each notified case a number of mild cases could usually be found, so mild as to be scarcely recognisable. Epidemics were due to the existence of large numbers of healthy carriers.

**Item XVI.—Miscellaneous.**—Under this head Dr. Ricardo Jorge made an interesting statement on an apparently new disease known as "exanthematic fever," which might be confused with typhus fever. This fever has been reported from Lisbon, Algerian ports, Marseilles, Tunis (fièvre boutonnière) and Madrid (fièvre exanthématique de la Méditerranée). The disease is characterised by a papulo-vesicular rash which leads to scabbing, no stupor or other mental symptoms, and a negligible mortality. The disease does not seem to be identifiable with the

so-called new disease of Bombay (of which I gave a brief account), but has many points in common with the Tsugamshi disease of Japan (Japanese river fever).

### APPENDIX.

#### LIST OF DOCUMENTS ANNEXED TO THE REPORT.

1. Official list of Delegates.
2. Financial Report of the Director of the Office.
3. Draft Report to Participating Governments.
4. Agenda of the Conference.
5. Report of the Egyptian Quarantine Board on the Pilgrimage for the year 1929.
6. Report by Dr. Atkey on the Quarantine Station at Suakim.
7. Report of the Pilgrimage Commission.
- 7a. Report of the Pilgrimage Commission (English text).
8. Report by Dr. Stock on the use of Wireless Messages for Quarantine operations.
9. Report by the delegate for Spain on the use of Wireless Messages for Quarantine operations.
10. Note on the Quarantine Rules for Aerial Navigation in Japan.
- 10a. Note on the Quarantine Rules for Aerial Navigation in Spain.
11. Note by Dr. Van Campenhout on measures to be taken to prevent the spread of Yellow Fever by Aircraft.
12. Statement of Egyptian restrictions against arrivals from Karachi by air.
13. Office Note on Sanitary Regulations for Aerial Navigation.
14. Note by Dr. Park on Rat-guards (French text).
15. Note by Dr. Park on Rat-guards (English text).
16. Note by Dr. Rupert Blue on the Type of Rat-guard used in the Philippines.
17. Report by Dr. Chitre on observations on Rat-guards in Bombay.
18. Note by Major Taylor and Dr. Chitre on Electric Rat-guards.
19. Report of the Quarantine Commission I.
20. Report of the Quarantine Commission I (Continued).
- 20a. Report of the Quarantine Commission I (English text).
21. Note by the Spanish delegate on the application of the Opium Convention.
22. Note by Professor Lenz, on "Acetone," a new Codeine derivative.
- 22a. Report of the Opium Commission.
23. Copy of British Statutory Rules on Deratisation (No. 832 of 1929).
24. Report by Dr. Boye on Yellow Fever in French West Africa.
25. Report by Dr. de Vogel on accidental infections with Yellow Fever.
26. Report by Dr. Van Campenhout on the outbreak of Yellow Fever at Matadi, 1928.
27. Note by Dr. Van Campenhout on the prophylaxis of Yellow Fever in Africa.
28. Note by Sir George Buchanan on Yellow Fever in British West Africa.
29. Report of the Yellow Fever Commission.
- 29a. Report of the Yellow Fever Commission (English text).
30. Note by Dr. Boye on the Relation between Pneumonic Plague and Temperature.
31. Report by Dr. Tsurumi on Plague in Mongolia in 1928.
32. Note by Dr. Columbani on Anti-plague inoculation in Morocco, 1929.
33. Note by Dr. Syssine on Plague in Eastern Russia.
34. Note on Administrative measures taken against Smallpox in England and Wales.
35. Note on Administrative measures taken against Smallpox in Germany.
36. Note on Administrative measures taken against Smallpox in Norway.
37. Note on Administrative measures taken against Smallpox in Spain.
38. Note on Administrative measures taken against Smallpox in Sweden.
39. Note by Dr. Tsurumi, on the Initial Rash of Smallpox.
40. Note by Dr. Hamel on Post-Vaccinal Encephalitis in Germany.
41. Note by Dr. Kling on Post-Vaccinal Encephalitis in Sweden.
42. Report by Colonel Graham on the Epidemic of Smallpox in Aden, 1929.
43. Note by Dr. Jitta, on the outbreak of Smallpox (Alastrim) in Holland, 1929.
44. Report of the Smallpox Commission.
45. Note by Dr. Macnally on Industry and Tuberculosis in England and Wales.
46. Note by Dr. Macnally on Industry and Tuberculosis in England and Wales (English text).
47. Note by the late Dr. Gram on Industry and Tuberculosis in Norway.
48. Note by Dr. Hamel on Industry and Tuberculosis in Germany.
49. Note by Dr. de la Torre on Industry and Tuberculosis in Mexico.
50. Note by Dr. Syssine on the preparation of Jennerian Vaccine in Soviet Russia.
51. Note by Dr. Tsurumi on Tuberculosis Statistics in Japan.
52. Note by Dr. Boye on Tuberculosis and Vaccination with B. C. G. in West Africa.
53. Note by Dr. N. . . . . of B. C. G.
54. Note by the French Ministry of Hygiene on Acute Poliomyelitis.
55. Note by Dr. Syssine on the distribution of Hospitals in Soviet Russia.
56. Note by the delegate for Spain on the Spanish rules concerning the use of Antiseptics and colouring matters in food.
57. Note by Colonel Harrison on the Frequency of Syphilis in Great Britain.
58. Note by Dr. Hamel on the Frequency of Syphilis in Germany.
59. Note by Dr. Hamel on Tabes and General Paralysis in Germany.
60. Note by Dr. Hamel on Anti-venereal measures in Germany.
61. Note by the Office on Anti-venereal measures in France.
62. Note by Sir George Buchanan on Rural and Urban Mortality in Great Britain.
63. Office note on District Nurses in France.
64. Office note on the protection of Maternity in France.
65. Note by Dr. Raynaud on a new method of employing "Chloropierine."
66. Note by Dr. Boye on Antirabic measures in the French Colonies.
67. Note by Dr. Tsurumi on Scarlet Fever.
68. Note by Dr. Boye on Sleeping sickness in French West Africa.
69. Note by Dr. Hamel on the protection of Maternity in Germany.
70. Note by Dr. H. S. Cumming, on Sanitary Organisation in certain South American Ports.
- 71-75. Miscellaneous documents relating to the application of the International Sanitary Convention of 1926.
76. Note by Dr. Doorenbos on the rôle of Bacteriophage in Plague.
77. Health Organisation in Australian Ports. (Australian Ministry of Health.)
78. Report by Dr. Dalrymple-Champneys on Undulant Fever.

#### THE ROSS INSTITUTE INDUSTRIAL ANTI-MALARIAL ADVISORY COMMITTEE.

The second quarterly meeting of this committee was held on 14th October, 1929, and the third meeting on 13th January, 1930.



At the second meeting Sir Malcolm Watson dealt with conditions at Korusput. Here both malaria and blackwater fever are very prevalent. A certain amount of open drainage had been carried out by Government, but the speaker had recommended sub-soil drainage as being both cheaper and more efficient. Kuala Langat, F. M. S., a district which had at one time been freed from malaria, had now again become malarious; the attention of the F. M. S. Government had been drawn to the matter. Twelve planters from Bengal, Assam, and South India had attended the first short course of instruction; the course lasted a week, and included field demonstrations, lantern lectures, and cinema films. An increasing number of medical men were availing themselves of the facilities for the study of malariology at the Ross Institute. In Assam the malaria problem generally is a very serious one, and something in the way of a large and permanent organisation to combat malaria in that province is required; the difficulty is to get men who are capable and qualified for the work; no smaller scheme will be effective, and the whole problem merits consideration. An expedition with Sir William Simpson at its head had been sent out to examine the malaria position in an area of some 2,000 square miles on the borders of the Congo, belonging to the Roan Antelope Copper Mines and the Rhodesian Selection Trust. In Ceylon the Malaria Control Scheme was progressing favourably and extending its activities. The chairman, Mr. A. W. Still stated that the facilities at the Ross Institute were being brought to the notice of managers of rubber plantations who were on leave in the United Kingdom.

At the third meeting, the position in Assam was further considered. Reports from many gardens indicated that considerable progress was being made in controlling malaria, and Dr. G. C. Ramsay's work in Cachar was specially mentioned. With regard to Rhodesia, Sir Malcolm Watson expected to go out there in March, and to review the position. A tribute was paid to the work of the Bengal Anti-Malaria Co-operative Societies and of Rai Dr. G. C. Chatterjee Bahadur, who had been made an honorary life fellow of the Ross Institute. The malaria control at the Tata Iron and Steel Co.'s mines in Bihar under Mr. Senior-White had achieved very good results. The last short course for planters had been attended by planters from South India, Ceylon, Malaya and by doctors proceeding to Borneo. Experiments were being carried out with several different types of oils as larvicides in both India and Malaya. In Ceylon a river had been oiled for 22 miles, a special lorry with sprayer being used as an experimental measure. In Assam recent reports stated that the death rate among coolies on the tea gardens was 3 per cent. below the average for the general population on account of the better health conditions on the gardens.

#### THE ASSAM BRANCH OF THE ALL-INDIA MEDICAL LICENTIATES' ASSOCIATION.

We have only recently received a copy of the Proceedings of the Second Session of this Association, held at Dibrugarh on 26th and 27th May, 1929, but a short abstract of these Proceedings may be of interest to many of our readers. The meeting was held at the Berry White Medical School, under the presidency of Mr. E. S. Roffey, Secretary of the Assam Branch, India Tea Association.

In addressing the president, Dr. B. C. Dass dwelt upon the hardships of life of sub-assistant surgeons and licentiates. "Whenever there is an epidemic of cholera, smallpox, or influenza, a licentiate is the only friend, philosopher, and guide to the people in the infected villages. Cut off from all communications, deprived of the amenities of home life, he has to run from house to house, from village to village, sometimes without food or drink, risking his own life, attending to the victims of infectious diseases day and night, and submitting full reports thereof to the authorities." He also mentioned that many such licentiates had contracted fatal illness when employed on such duties.

Yet recognition of their services was but tardy. The police may be the backbone of the country, yet the medical subordinate is even more essential. A sub-assistant surgeon's pay is from Rs. 75 p.m., to Rs. 175 p.m. after 20 years' service, with a selection grade of 12 per cent. who may rise to Rs. 200 p.m., whereas sub-deputy collectors and P. W. D. overseers get from Rs. 150 to Rs. 400 p.m. Yet prices of foodstuffs and clothing are higher in Assam than in other parts of India, and educational facilities for children are few. The ten years' bond was irksome, whilst conditions of the licentiates employed on tea gardens included no security of tenure, or assured prospects with regard to promotion. The practice of appointing unqualified men to medical posts in the tea gardens is especially deplorable, as it limits employment for the qualified and opens up channels for abuses. The present type of sub-assistant surgeon's quarters is unsuitable and needs to be altered. The speaker emphasised the necessity for extending the medical course for licentiates from four years to five. Finally, the speaker emphasised the loyalty of the class of medical men for whom he spoke to Government.

The annual report for 1928 was next read. This showed that a new branch had been opened in Silchar, and 130 new members had been enrolled during the year as compared with 35 in 1927.

In his presidential address, Mr. Stuart Roffey mentioned that he had lived in the Assam Valley for more than 26 years. He pointed out that H. E. the Governor had drawn special attention in an official report to the valuable services rendered by subordinate medical officers in the anti kala-azar campaign in Assam, and dwelt on the supreme value of their work on the tea gardens. He also quoted the recorded opinions of tea garden medical officers as to the great value of the work done by licentiates. With regard to pay and prospects, it was a question of economic demand and supply. The question of excluding unregistered medical practitioners was under consideration. Taking the budget provision of the province for 1927-28 the percentage of expenditure on different heads was for medical relief 4.3, for police 9.9, for communications 11.9, for education 10.6, and for public health 1.5. These were relative proportions which required re-adjustment. It was "up to" local boards to remedy the state of affairs in the areas which they controlled.

#### THE FACULTY OF TROPICAL MEDICINE, BENGAL.

The following students are declared to have passed the D. T. M. Examination, Session 1930.—

*Passed.*

(Arranged in alphabetical order.)

1. Dr. Tara Prasanna Bhattacharjee, M.B. (Cal.), Private Practitioner.
2. Dr. Jogesh Chandra Chakravarty, II, L.M.F. (Bengal), Sub-assistant Surgeon, Govt. of Bengal.
3. Dr. Anil Krishna Choudhury, M.B. (Cal.), Private Practitioner.
4. Dr. Nirmal Chandra Choudhury, M.B. (Cal.), Medical Officer, Kelvin Jute Mills, Titagarh, 24-Parganas.
5. Dr. Nirmal Chandra Das Gupta, L.M.F. (Bengal), Sub-assistant Surgeon, Govt. of Bengal.
6. Dr. Chittaranjan Dutta, M.B. (Cal.), Assistant Surgeon, Govt. of B. & O.
7. Dr. Narayan Das Dutta, M.B. (Cal.), Assistant Surgeon, Govt. of Bengal.
8. Dr. Harold Aloysius Henry D'Silva, M.B.C.S. (Eng.), L.R.C.P. (Lond.), L.M.D., Assistant Surgeon, Govt. of India, employed under I. R. F. A.
9. Dr. Thomas Joseph D'Silva, L.C.P.S. (Bom.), L.M.D., Assistant Surgeon, Govt. of India.
10. Dr. Krishna Kishore Dutta, M.B. (Cal.), Private Practitioner.
11. Dr. Cyrill Aloysius Fegredo, L.M.F. (Bengal), Military Assistant Surgeon, I.M.D.



12. Dr. Prakas Chandra Ghosh, M.B. (Cal.), Private Practitioner.
13. Dr. Profulla Ranjan Gupta, M.B. (Cal.), Assistant Surgeon, Govt. of Assam.
14. Dr. Harbhagwan, L.S.M.F. (Punjab), I.M.D., working in the Malaria Survey of India, Central Research Institute, Kasauli.
15. Dr. Hartwant Singh, L.S.M.F. (Punjab), I.M.D., Govt. of India.
16. Dr. Bhupesh Chandra Lahiri, M.B. (Cal.), Private Practitioner.
17. Dr. Yeruva Surya Narayana Rao, M.B., B.S. (Madras), Assistant Surgeon, Govt. of Madras.
18. Dr. Rengaswami Varadaraja Narasimhulu Nayudu, L.M.P. (Madras), Medical Officer, Dhanushkodi.
19. Dr. Mattakat Govinda Pillai, M.B.B.S., Health Officer, Govt. of Madras.
20. Dr. Gunendra Nath Sen, M.B. (Cal.), Private Practitioner.
21. Dr. Neelakanta Seshadrinathan, L.M.S. (Madras), M.B.B.S. (Madras), Assistant Surgeon, Govt. of Madras.
22. Dr. Mualidhar Nanhuram Sandel, M.B.B.S. (Bom.), Assistant Surgeon, Govt. of Central Provinces.
23. Dr. Annada Prasad Sinha, M.B. (Cal.), Assistant Surgeon, Govt. of Behar & Orissa.
24. Dr. Charles George Joseph Speechly, L.M.F. (Bengal), Military Assistant Surgeon, I.M.D.
25. Dr. Eardley David Stephens, Diploma of Medical College, Madras, I.M.D., Assistant Surgeon, Govt. of India.
26. Dr. Bhupendra Nath Sur, M.B. (Cal.), Private Practitioner.
27. Dr. Kurisuveetil Paly Thomas, L.M.S. (Madras), Municipal Health Officer, Govt. of Madras.
28. Dr. U. Tin, L.M.P. (Burma), Sub-Assistant Surgeon, Govt. of Burma.
29. Dr. George Domingo Veliath, M.B.B.S., Govt. of Madras.
30. Dr. Arthur Greville Young, L.R.C.P., L.R.C.S. (Edin.), L.R.F.P.S. (Glas.), Medical Officer in charge, Kalna Mission Hospital.

## Current Topics.

### The Status of the Therapeutics of Irradiated Ergosterol.

By A. F. HESS, M.D., J. M. LEWIS, M.D.,  
and  
H. RIVKIN, B.A.

(Abstracted from *The Journ. Amer. Med. Assoc.*,  
Vol. 93, No. 9, 31st August, 1929, p. 661.)

SOMEWHAT more than three years has passed since Windaus and Hess, as well as Rosentheim and Webster, reported the remarkable antirachitic activity of irradiated ergosterol.

All are agreed that irradiated ergosterol is an agent of exceptional potency and reliability in the prevention or the cure of rickets. The time is past for a discussion of this point. There are, however, several questions which demand consideration at the present time. One that has been raised repeatedly concerns the safety of this new therapeutic agent, more particularly whether there is any danger of its doing harm. A corollary of this question, and one which has been the subject of quite as much discussion, is that of the proper dosage of irradiated ergosterol. In an earlier paper we concluded that "as yet we have not sufficient clinical experience to define its proper dosage. Furthermore, the various preparations cannot be evaluated, as they have not yet been assayed on the basis of the number of 'curative units (rat)' which they contain." It was added that "the amounts now

recommended and employed are unnecessarily high," and that the time was not ripe to distribute this drug to the medical profession.

### Results of Experiments with Various Preparations of Ergosterol.

During the past year we have been engaged with a further study of irradiated ergosterol, in the laboratory and the clinic. In the main, two preparations have been studied; an American product and a German product. It should be added that the manufacturers of the German preparation have realized that it was unnecessarily potent and have recently reduced its strength to about one-tenth the original. Although irradiated ergosterol has not been marketed in the United States, owing to uncertainties in regard to its dosage, it has been widely used in Germany, France and England, both in hospitals and in private practice. In this country its use has been restricted to investigative studies in numerous clinics throughout the country.

Beginning in October, a large group of infants was given either the American or the German preparation of irradiated ergosterol in various amounts, ranging from minimal doses to what might be considered generous amounts. The age of the infants ranged from about 3 to 9 months, and the medication was continued in many instances uninterruptedly from autumn until summer; in some it was begun during the course of the winter. However, in general, the duration of observation was long and embraced a period of several months.

Our results were well defined and can be summarized in a few words; it seems unnecessary, therefore, to consider them in detail or to reproduce the data in tabular form. Full term infants were protected from rickets, almost in every instance, except when the smaller amounts were given. The progress of every infant was followed in the usual way by means of direct clinical examinations, roentgenograms and analyses of the blood for its concentration of calcium and of inorganic phosphorus. In an occasional case, mild beading of the ribs, craniotabes or bowing of the legs developed. Of course the spectacular healing, for example, of craniotabes, which was brought about by large amounts of irradiated ergosterol, cannot be expected when much smaller amounts are given. In spite of partial failures, irradiated ergosterol must be regarded as one of the most remarkable of specifics. In therapeutics there is no such thing as an absolute or infallible specific; all fail to a certain extent occasionally. This is known to be true of quinine in its relation to malaria, of arsenic preparations in relation to syphilis and recurrent fever, and of all other specific remedies with which medicine is blessed.

It will be noted that emphasis has been laid on the success of treatment in infants that were born at full term. It is highly important that this distinction should be borne in mind, for it will be found, not infrequently, that preparations of irradiated ergosterol given in adequate doses will fail to protect rapidly growing premature infants. As will be brought out in the discussion of dosage, such babies require very large amounts of irradiated ergosterol, and even when this precaution is observed it may be found that rickets has not been entirely prevented.

In some instances, bow legs developed unaccompanied by other evidences of rickets toward the end of the first year of life. In view of the fact that the inorganic phosphate of the blood was found to be of normal concentration in several of these cases, it is probable that the clinical condition was that which, some years ago, was designated as "non-rachitic bowing of the legs." However, this experience indicates that even when mothers learn to give antirachitic therapy as a routine measure, bowing of the legs will not become an exceptional deformity.

During the past few years we have emphasized that rickets may develop in an infant in spite of the fact that the concentrations of inorganic phosphorus

and of calcium in the blood are normal. Although we do not wish to discuss the subject in the present connection, it may be mentioned that our clinical and laboratory study has once again confirmed this point of view. It was found that when inadequate amounts of antirachitic agents, for example, of irradiated ergosterol or of irradiated dried milk, were given as preventive measure, and when rickets developed—as evinced by the rentgen and clinical examinations—concentrations of 6 mg. or more of inorganic phosphorus and of 10 mg. or more of calcium per hundred cubic centimetres, in other words normal value, were found in the blood.

#### *Clinical Indications.*

Our clinical experience with irradiated ergosterol has been confined almost entirely to rickets and tetany, but from time to time we have had the opportunity to give it in other conditions. Some years ago, one of us described a pathologic condition of the bones as "non-rachitic softening of the ribs in infants and children." This undue yielding of the thoracic wall is not uncommon and is often found in combination with a softening or flattening of the occipital part of the cranial vault. It is not a form of rickets, as it is accompanied by none of the characteristic clinical, rentgenographic or chemical signs of this disorder. When irradiated ergosterol is given in this condition, it has seemed to bring about added firmness to the ribs, a result which we have repeatedly failed to accomplish by means of cod-liver oil, elementary phosphorus or direct ultra-violet irradiation. It was used in only six cases of this kind.

We have had no opportunity to test the activity of irradiated ergosterol in osteomalacia. There is every reason to believe, however, that it should prove efficacious in this condition, which, in the classic case, is essentially adult rickets. At the present time there is danger of various abnormal conditions of the bones—some with high as well as some with low calcium in the serum—being classed as osteomalacia. Starlinger and Hottinger have reported favourable results with irradiated ergosterol in cases of osteomalacia of long standing which had resisted other therapy. It would seem as if the use of this concentrated therapeutic agent might be introduced with great benefit into a country such as India where osteomalacia is still rife among the female population, as the result of the observance of the system of "purdah." Perhaps it might be dispensed in the same way as quinine has been distributed in districts in Italy where malaria is endemic.

Irradiated ergosterol may be tried with caution in cases of Paget's disease. Our experience is too limited in this field to warrant any general expression of opinion as to its value. In general, a contraindication to its usage is marked endarteritis, which not infrequently is an accompaniment of this disorder.

With regard to the claims for irradiated ergosterol in the prevention or the healing of dental caries, in our opinion the main etiologic factor in dental caries is not rickets and therefore caries will not be eradicated by any antirachitic agent, however potent. Irradiated ergosterol may improve the calcification of the teeth if given during the stage of their development; in respect to the deciduous teeth this period would have to embrace prenatal life. Recently Weinmann of Vienna published a short account of an investigation that is of interest in this connection. He showed that in rats it is possible by means of very large doses of irradiated ergosterol to induce a hypercalcification of fully developed teeth. In view of the tendency to prescribe irradiated ergosterol for clinical conditions of the most varied kind, we may state that we have failed to find it of value in the prevention or cure of respiratory infections or of anaemia, in the healing of the ordinary fracture, or in the induction of growth.

#### *Dosage.*

As brought out last year, the main difficulty in establishing a reliable dosage for irradiated ergosterol

lies in the fact that the various preparations differ widely one from another and that there has been no concerted attempt at standardization. Biologic tests carried out during the past year have shown that four of the most widely used preparations—manufactured in Germany, the United States, France and England—bear the following ratios to one another: 2,500 to 11 to 40 to 14. That there should be such marked variations in potency between preparations is not surprising in view of the lack of uniformity in the original ergosterol, in the intensity of irradiation, in the solvents used and in the type of irradiating equipment. A standardization on the basis of milligrams, as is resorted to commonly abroad, will only lead into new difficulties. For example, the product with a vitamin potency 2,500 times that of cod-liver oil, as well as the one found to be only forty times as active, is stated to contain 10 mg. of ergosterol per cubic centimetre. Again, of the two French preparations, one was found by biologic test to be twenty times as potent as the other although, according to the label, it contains only twice the number of milligrams of ergosterol per cubic centimetre. The only way to make progress in this field so that irradiated ergosterol is rendered suitable for therapeutic use is to standardize preparations on the basis of animal tests. Recently this course has been determined on by a number of manufacturers in the United States, who have decided to assay their preparations so that they will have a potency 100 times that of a high-grade standard cod-liver oil. Our study has been carried out with a preparation of this titre and, as the result of clinical observations, the following dosage has been formulated:

Eight to ten drops a day as the prophylactic dose for infants who are growing at the normal rate. Premature and exceptionally rapid-growing infants must be considered as a separate group and dosage gauged according to a different scale. They will require at least 15 drops a day and even more should be given if signs of rickets develop. Hottinger has drawn a distinction between premature infants which weighed more and those which weighed less than 2 kg. The latter group he was unable to protect satisfactorily against rickets by means of irradiated ergosterol medication. If loss of appetite or slight diarrhoea should supervene, medication should be temporarily discontinued.

For cure, 15 drops of this standardized irradiated ergosterol should be prescribed in cases of mild rickets and 20 drops for the moderate cases. Severe instances, such as are rarely met with, excepting in Italians and negroes, will require still larger amounts for a short period. This same higher dosage will probably be found necessary for cases of late rickets and for osteomalacia, which are notably refractory. When exceptionally large doses are given for prevention, it would seem of advantage to control medication by occasional estimations of both the calcium and the inorganic phosphorus content of the blood.

No doubt these directions will have to be modified in the light of future experience. It is preferable that we shall have to increase rather than decrease the dosage. As there is a tendency for irradiated ergosterol to continue to exert its effect for a considerable period after it has been discontinued, it may be of advantage to give it interruptedly for prophylaxis or perhaps only a few times a week.

It may be in place to add a few words in regard to other irradiated products which are being advocated for the protection or cure of rickets. It was suggested, in 1927, in one of the early papers on irradiated sterols, that activated cholesterol might be added to cod-liver oil in order to fortify it and give it several times its original potency. Preparations of this kind, in which irradiated ergosterol is used, are being marketed; their strength is about five times that of cod-liver oil of good quality. One of the advantages of such preparations is that they contain the fat-soluble vitamin A as well as the antirachitic vitamin. The presence of cod-liver oil in the

preparations would seem to militate greatly against their adoption on a large scale.

At the same time, it was stated that excellent clinical and laboratory results had been obtained with the use of irradiated yeast. Possibly this product might be suitable for countries in which the item of expense is the determining factor. It has been suggested that in Poland, where rickets is unusually widespread and severe, and where poverty is extreme, it may be practicable to distribute irradiated yeast on a large scale.

As is well known, both fluid and dried milk have been irradiated in order to endow them with antirachitic virtue. We have had no clinical experience with irradiated fluid milk, which is being dispensed in some of the large communities of Europe, notably Frankfurt and Basel. Irradiated dried milk has, from the outset, seemed to be a valuable preparation. It has a definite antirachitic property which is not lost by ageing, nor is its content of vitamins A and C essentially diminished during the course of activation. This product is of moderate potency and is suited for preventive rather than for curative purposes; it is not adequate in itself to protect premature infants. From our experience there appears to be little danger of hypercalcaemia developing from the amount of irradiated dried milk which a baby normally consumes. The highest concentration which we have found has been 12.7 mg. The potency of irradiated milk will have to be carefully supervised and placed under control, as there is constant danger that owing to some technical irregularity the milk will be imperfectly activated.

Not only milk but cereals are being subjected to the ultra-violet rays. Irradiated cereal can play little or no rôle in the eradication of rickets. Rickets is a disorder of the first year of life, and during this period such small amounts of irradiated cereals can be fed as to render them inconsequential from a therapeutic point of view. Such a food may be regarded as an adjuvant to other antirachitic measures, and perhaps of value in later childhood when the requirement of the antirachitic factor has become greatly reduced.

#### Conclusions.

Further clinical experience with preparations of irradiated ergosterol has shown that it is a specific for rickets, tetany and osteomalacia. As yet it has not been proved of definite value in other clinical conditions.

In the past year, a standard dosage has been established for the prevention and cure of rickets. Premature and exceptionally rapid-growing infants must be regarded as a separate group and dosage gauged according to a different scale. The basis of this standardization is a biologic estimation of antirachitic potency rather than a gravimetric assay of the irradiated ergosterol.

It has been found that, if the prescribed dosage is observed, neither toxic symptoms nor hypercalcaemia need be feared. These phenomena seem to be entirely or almost entirely due to an excess of antirachitic action. Hypercalcaemia can also be induced experimentally by giving undue amounts of cod-liver oil.

Irradiated milk, especially dried milk, is likewise a valuable product in combating rickets and tetany, more especially in their prevention. Irradiated cereals will probably play no rôle in the control of rickets.

In view of the numerous technical difficulties involved in the course of activation, such biologic products as irradiated ergosterol and irradiated foods should be subjected to careful laboratory control.

### Hypopyon Ulcer of the Cornea: A Brief Review of One Hundred Consecutive Cases.

By A. CHRISTIE REID, M.D. (Aberd.),  
(*The Lancet*, Vol. CCXVII, 13th July, 1929, p. 64.)

THE object of this article is threefold: (a) To impress on the practitioner that any corneal ulcer with

pus in the anterior chamber is threatening an eye; (b) to supply figures for comparison with new methods of treatment; and (c) to commend early opening of the anterior chamber by a special incision.

These ulcers vary much in severity in different countries and in different parts of the same country. Of my cases 60 were miners working below ground; these represent a type generally severe. In only one case—and he not a miner—was a foreign body present in the ulcer. I have not known such an ulcer to follow extraction of a foreign body in our casualty department where we deal with some 2,800 foreign bodies per annum. Nine cases were women; only one was a child, aged 2, which cleared well with lotion and atropine only. Several cases presenting late or in debilitated or aged persons were doomed from the start, but these have been included, though for statistical purposes they are not of much value. The 100 cases range over six years and all were hospital cases.

#### Methods of Treatment.

Treatment has varied somewhat, but the following methods have been tried out and are now more or less stereotyped as follows: (a) Rest in bed, as flat on the back as possible, for at least 5 days and often for 15. Too early assumption of the erect posture, and too prompt dismissal from the ward, has been too often followed by recurrence. (b) Atropine drops and frequent lustrations even to the intensive half-hourly method recently advocated, if this can be carried out. (c) A search is made for septic foci elsewhere—e.g., teeth and ear sac—and, if possible, these are dealt with. (d) Carbolic acid with pure carbolic unless the cornea is deeply infiltrated. If the case is only seen after the fifth day this often does more harm than good. Actual cautery, even by chauliuge, I have found to produce a very dense but soft scar; but I confess to not having adopted the carefully graduated method of Mr. Edgar Stevenson, of Liverpool. (e) General tonic treatment, and more recently sodium salicylate intravenously. (f) Section. As it is more especially this last I wish to advocate, I shall briefly describe my method.

Under (local anæsthetic) cocaine a small keratome incision just inside the limbus is made in lower part of the cornea into the anterior chamber. A modified Usher's spatula is then introduced, and on to it with a special semi-circular knife (like an old-fashioned vaccination lancet) a vertical incision is made through the corneal substance, thus completing an inverted T. Both instruments are made by Messrs. Down Bros. and Weiss and Son. The first incision is best done facing the patient, the second from behind. Thus the lens is protected and complete control of the eye obtained by the spatula. The second incision may require two or three to and fro movements of the knife, but may be done by one sweep from centre to periphery. The advantage of this incision is not only its completeness but its accessibility for subsequent tappings if deemed necessary. The point of the crossing is easily made out even weeks after, and I have with the greatest ease broken in with a blunt instrument 12 days after the original incision. Evacuation of the pus is not essential; it sometimes flows freely, at others is sticky and thick. It should not perhaps be left in the wound, as it is then likely to act as a wick to introduce infection. One, two, or more subsequent tappings at intervals of two or three days may be indicated.

#### Results of Early Section.

Results of treatment may be considered statistically, but if so, great reserves must be made as there are many varying factors. Thus 63 of my cases were sectioned, but I do not advocate section in every case, though I have never regretted an early section. And the fact that of 37 cases not sectioned 30 did well—result "good" or "fair"—does not prove anything against section, because most of these cases were of a mild type. Of the 37 non-sectioned cases 27 were good, 3 were fair, 7 were bad, and none was "lost." Six of the bad were cautery cases which perforated.

My sectioned cases fall into two groups—(a) those done before the fourteenth day from the date of onset, usually a trauma; (b) those on the fifteenth day or later. Of (a) 3 were lost, 11 bad, 5 fair, 14 good, total 33. Of (b) 6 were lost, 12 bad, 5 fair, 7 good, total 30. Thus 9 eyes out of the 100 were lost; but statistics of removal depend largely on the personal factor. I endeavour to retain an eye if it has only P. L. (perception of light) and is not painful. Un-sightliness does not weigh heavily.

The better results of the early-sectioned cases are enhanced by a closer study of the failures, but space does not allow of that here. In two of these latter the damage seemed to be done by a plastic iritis quite different from the simpler cyclitic hypopyon. All other methods of treatment seem ineffectual in such cases, and section is the only means I know of that has in one or two caused definite arrest of the process, even when done late.

But the time factor is not everything. Some cases, for example, show very extensive or deep ulcer only three or four days after onset; these are virulent, but many of these may be saved by prompt section. On the other hand, a fair proportion of late cases that had run a mild but chronic course were sectioned after all other means had failed, and this brought about definite arrest with a good visual or scar result.

The terror of the Guthrie-Sæmisch section with its adherent iris is done away with by this innoxious yet efficient section. An adherent iris is a rarity and usually due to an error in technique or the presence of a plastic iritis that would have blocked the pupil in any case. In only five cases of the series did lens opacity result. In two of these the patient jibbed badly, and it is possible that with the dilated pupil of atropine the point of the keratome may have touched the lens. I think, however, that the presence of semi-solid pus lying for weeks, it may be, on a segment of iris and lens, may in itself, apart from any error in technique, cause some localized lens opacity that may later involve the whole lens.

Finally, I would urge that it is not on account of plus tension that section is undertaken. Renewal of aqueous is the vital necessity. A by-effect may be the lowered corneal tension allowing healing lymph to pass more freely through the corneal tissue. The two flaps of the section have at times been noted as definitely oedematous. Plus tension may occur, but in my experience is a late phenomenon. Two of my obstinate cases had a definitely minus tension—one was sectioned, the other not; both did well.

Can one, then, lay down a definite line of treatment in hypopyon ulcer? I am afraid not. The cases are polymorphic. Space does not permit a closer analysis of types. No allusion has been made, for instance, to the diplobacillary type to which two in my series seemed to belong. Whether localized ultra-violet rays will replace present methods remains to be seen. London and Toronto statistics of hypopyon ulcer must be accepted with caution. A total of 48 "good" results in these 100 cases, of which 21 were sectioned and 27 not, may or may not be regarded as satisfactory.

## Reviews.

**THE DIABETIC A.B.O.: A PRACTICAL BOOK FOR PATIENTS AND NURSES.**—By R. D. Lawrence, M.A., M.D., M.R.C.P. (Lond.), London: H. K. Lewis and Co., Ltd. 1929. Pp. VII plus 55. Price, 3s. 6d. net.

THE author seems to have written this little book to supply a practical guide to nurses and patients, especially those who have to follow his instructions regarding the "Line Ration Scheme" in dieting, described scientifically in his other book entitled *The Diabetic Life*. We have no hesitation to say that the author has succeeded in this object. The book gives clear practical details about diet which will be found

very helpful to laymen in making a suitable selection of food to meet their special requirements. In a small compass of 55 pages, the author has given sound practical advice as to what a diabetic patient should know to keep himself fit.

The recipes of some diabetic dishes given in the book have been prepared by Staff Nurse Wheeler of the Diabetic Kitchen of King's College Hospital. These are varied and give the diabetic quite a wide range to select his dishes from.

J. P. B.

**MEDICAL INSURANCE EXAMINATION: MODERN METHODS AND RELATING LIVES.**—By J. P. MacLaren, M.A., B.Sc., M.B., C.M. & J.P. Second Edition. Greatly enlarged. London: Baillière, Tindall and Cox. 1929. Pp. XV plus 646. Price, 30s. net.

As was to be expected a second edition of this book has appeared.

Most medical men at some time or other are called upon to conduct medical examinations on behalf of Insurance Companies. To those who do this work constantly, the book, which is thoroughly up to date, will be a very great boon indeed. Part II dealing with the physical examination is as complete as it is possible to make it, in the light of our present day knowledge, while Part III dealing with diseases as insurance impairments contains much that is new and accurate. Probably the chapter on "The rating of a risk" embodies the latest available data on how to assess a given life, after every factor in the build and family history, occupation, habitat, race, age and impairments are taken into consideration.

This has been made possible by the method carried out principally in the United States and Canada, by the system of rating on a mortality ratio basis. Some Insurance Companies still ask the medical examiner to state whether they regard an applicant whom they have examined, as a first class life, or average, or doubtful, or bad. This book will show how it is possible to assign by means of figures the extent of the loading necessary, should there be any called for, and the Company is therefore able to recommend to the applicant the kind of policy, which is most advantageous to him.

A. S. A.

**MEDICAL JURISPRUDENCE FOR INDIA.**—By Major-General Sir Patrick Hehir, I.M.S., K.C.I.E., C.B., C.M.G., M.D., F.R.C.P., F.R.C.S., F.R.S.E., and the late J. D. B. Gribble, I.C.S. Sixth Edition. Revised, enlarged and brought up to date by Lt.-Col. D. G. Rai, I.M.S. Associated Publishers (Madras), Ltd. Higginbothams Dept. 1929. Pp. XL plus 1153. Price, not stated.

THIS, the sixth edition of a leading textbook on medical jurisprudence for India, is particularly welcome for two reasons. The last edition came out as far back as 1908; and in its present shape it has had the great advantage of a revision by Lieut.-Col. D. G. Rai, lately Professor of Medical Jurisprudence at the Madras Medical College. Apart from this, there is in this edition a certain amount of interesting new matter. There are new chapters on "the law in relation to medical men," on "deaths from cold, sun, heat, and starvation," on "virginity and pregnancy" and on "impotence and sterility, legitimacy and survivorship." On "testing for blood-stains," too, a new chapter has been written; and here the assistance rendered to General Hehir by Dr. Arthur Powell seems to have been very considerable.

The book has, necessarily, a medico-legal bias throughout. There is a thorough discussion of the position of the medical man in regard to his patients and the general public. This matter has assumed importance in recent years, on account of the law suits in which medical men have unexpectedly found themselves involved. Equally important is the chapter on life insurance, on account of the increasingly number of Indians choosing this form of provision for themselves and through the great risks undertaken by the companies, Indian as well as European.

An outstanding merit of the book is its readable quality, and the helpful and exhaustive nature of its index. But certain deficiencies are too clear to be ignored even by a friendly reviewer. The chapter on "Poisons," for example, while dealing with commendable thoroughness with indigenous poisons, omits to mention injections of gold chloride and bleaching powder for the treatment of cases of snake-bite. In the treatment of arsenic poisoning the dose of the antidote has not been mentioned at all. The discussion on the determination of age is lacking in fullness, particularly to readers for whom the subject has attained a new interest on account of the recent passing of the Sarda Child Marriage Restraint Act, and the Act for the Protection of Minor Girls. The ossification tables have not been given at all; nor is there any mention of the important fact that epiphyses unite earlier in India than in Europe.

It is deeply to be regretted that the authors should have thought fit to generalize on "false and concocted evidence" in India in a serious medical treatise; the use of such unrestrained and exaggerated language is clearly out of place. Nor can one pardon the sustained use of the officially banned and now practically obsolete expression, "native," which will only serve to irritate those Indian readers for whom the book is specially intended. How this could have escaped the notice of Lieut.-Col. D. G. Rai, himself a distinguished Indian, passes our comprehension.

B. G. M.

**SEX AND ITS MYSTERIES.**—By G. R. Scott, F.R.A.I., F.Ph.S. (Lond.), F.P.C. (Lond.), F.Z.S. London: John Bale, Sons and Danielsson Ltd. 1929. Pp. IV plus 198. Price, 10s. 6d. net.

To bring within the fold of a volume of two hundred pages quite a comprehensive and interesting account of the sex problem is no mean achievement and the author may well be proud that his treatment of the subject-matter of the book is quite as attractive as its title. In introducing the work the author, regretting the modern absence of ignorance on sex, remarks "It always was and it always will be the unknown that attracts. In this lies the whole fundament of love. Strip the woman of her mystery, rob the sexual act of its mystery, reduce both to the level of physiological entities and you destroy at the same time the only distinction between the intercourse of true lovers and that of the roué and the prostitute", and epitomises the present state of knowledge on such matter thus "every boy of 17 years and every girl of 15 years know as much about sex as did in a previous generation the average married man or woman. The bulk know a good deal more....." The apology for the book is contained in the statement "knowledge of sexual matters has in this decade reached such a pitch and become so ecumenic that ignorance is not so much deplorable as dangerous."

That the book is a frank exposition of the subject will be admitted universally. In the chapter on "Sex and Life" Kraft-Ebing's hypothesis that love cannot exist apart from sexual desire is controverted. The second chapter discourses on the theme that every animal is a physico-chemical organism and every fertilized ovum is potentially bisexual. Orthodox medical opinion may not support much of what the author says on "sexual development before and at puberty." A great deal of original matter (historical and otherwise) is incorporated in chapter VIII on the "sexual act"; the correctness of several popular fallacies are vigorously questioned.

The author's ideas on "continence" are refreshingly free from cant; he dismisses the religious view on the subject as prejudicial, illogical and sentimental; homosexuality is looked at from quite an original ethical perspective in chapter XIV.

The last part of the book which deals with prostitution and the train of diseases it spreads, is admirably written.

Though the book bristles with highly controversial statements, it is a unique addition to recent literature

on sex and deserves a place of honour for its purely scientific exposition of the subject.

S. S. R.

**HOO KWORM DISEASE: ITS DISTRIBUTION, BIOLOGY, EPIDEMIOLOGY, PATHOLOGY, DIAGNOSIS, TREATMENT AND CONTROL.**—By A. C. Chandler, M.Sc., Ph.D. London: MacMillan and Co., Ltd. 1929. Pp. XII plus 494. Illustrated. Price, 21s. net.

The author in his preface mentions that no book dealing in a comprehensive manner with the hookworm problem has appeared since the work of Dock and Bass in 1913.

As everyone who is in the least familiar with the subject knows, a vast amount of work on hookworm disease and its collateral subjects has been done since that date and innumerable papers have been published on it in practically all the medical and zoological journals in the world. It is therefore obvious that anyone approaching the subject for the first time will be faced with the task of a prolonged search of the literature to bring himself abreast of modern conceptions of hookworm disease, and with very few exceptions the important papers will not be accessible in any single library. This book meets the difficulty for it is really a concise summary of all the important work that has been published on the subject in all its bearings. So that although there is nothing original in the volume it is of great value because the author has brought together in a remarkably small space, considering the field he has covered, all the important observations that have ever been made on the subject. In effect the author, by his wide reading and careful summaries has brought within reach of all, a complete library of the hookworm problem from every point of view for the small cost of twenty-one shillings.

As a book of reference it cannot fail to be of the greatest use to the research worker, and for the beginner or isolated medical officer it will be equally useful in enabling him to learn his subject without outside assistance.

P. A. M.

**FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE.** Transactions of the Seventh Congress, British India, 1927. Vol. III. Published by Thacker's Press and Directories, Ltd., Calcutta. 1930. Pp. 761. Profusely Illustrated. Price, Rs. 25.

We have dealt very fully in our columns with the Seventh Congress of the Far Eastern Association of Tropical Medicine, and it is only necessary for us here to note with appreciation that with the publication of the present volume the series is now complete. The publishers are to be congratulated on the excellence of the get up, illustrations, and binding of the three volumes.

The present volume contains the papers read and discussions in Section IV—kala-azar, medical entomology, and helminthology; Section V—nutrition, deficiency diseases, immunology and chemotherapy, and rabies; and Section VI—veterinary medicine. It contains in all 84 papers, and is profusely illustrated. Notable papers in the volume are Mr. Iyengar's studies of the regional distribution of the anophelines of Bengal, and their parasitic nematodes and microsporidial parasites; Major Sinton's paper on Indian sandflies; the series of papers on nutritional problems by Lieut.-Col. R. McCarrison, I.M.S.; the series of papers by several authors on the beriberi problem; Col. Lloyd's studies on the clinical aspects of the Wassermann reaction; Col. Chopra's papers on Indian ephedrine, on Indian indigenous drugs, and on the opium habit in India; and the papers on rinderpest from the Muktesar Institute.

Every medical library in India should have a copy of the set of three volumes. Apart from the free issue of them to members of the Association, a few copies are available for sale from the publishers at Rs. 25 per volume.



**MEDICINE IN THE DAYS OF SHAKESPEARE.**—By H. R. Spencer, M.D., F.R.C.P. Pp. 27. London: John Bale, Sons & Danielsson. 1929. Price, 2s. 6d.

This is a reprint of a lecture delivered at University College in November 1929, and a most fascinating and readable essay. It should make an appeal, not only to the student of medical history, but to medical men in general, who are too apt to take the "bad old days" for granted, and to forget the origins of modern medicine. The author deals first with the historical aspect of the subject, and the relationship of Medicine to the State: the Tudors and the Stuarts all took an interest in medical matters, and Queen Elizabeth frequently attended medical discourses. There then follows an account of the typical physician of the time, usually an aristocrat and a man of learning, educated at one of the old universities, and with the grand tour behind him. The surgeons of the time, however, usually came from a humble social class, and had evolved from the former barber corporations. William Clowes, Peter Lowe, and Ambroise Paré are all dealt with; also the importance which was attached in those days to the study of anatomy. In dealing with the apothecary, the author gives a most interesting account of the quaint remedies of those days, when unicorn's horn was a universal panacea against plague, fevers, and poisons, and of the history of the use of cinchona. Finally comes a description of the midwife of Shakespeare's day, usually a woman of uncertain age, filthy habits, a gossip and addicted to drink, a precursor of the Sarah Gamp of a later generation, and a cousin of the untrained Indian *dai* of to-day.

Dr. Spencer's lecture is a valuable contribution to the literature on medical history, and one which we would cordially recommend to our readers.

R. K.

**RESEARCH AND MEDICAL PROGRESS, AND OTHER ADDRESSES.**—By J. Shelton Horsley, M.D. Pp. 208. St. Louis. The C. V. Mosby Co. 1929. Price, \$ 2.

This is an interesting collection of essays, addresses, and papers by an author who is Attending Surgeon to St. Elizabeth's Hospital, Richmond, Virginia, and who has both ideals to present to students and general practitioners, and a wide variety of interests. The first address deals with research and medical progress, and stresses the necessity for every medical man, whether general practitioner or specialist to have some special line of research constantly before him to keep his mentality keen and active. Reference is made to Sir James Mackenzie's well known career, an instance of a general practitioner who laid the foundations of present-day cardiology. (In this connection the author has made a blunder on p. 18 in referring to Burnley as "a small town in Scotland, where there was but little immigration and where families lived for generations." Burnley is a large manufacturing town in Lancashire; and the reviewer, who had the honour of being attended on many occasions by the late Sir James Mackenzie, when he was a small boy, and when Dr. Mackenzie was then unknown to fame, can remember the awe with which he watched Mackenzie use the sphygmograph.)

Many of the papers deal with gastric surgery, in which subject the author is clearly a specialist. Thus the address on physiology and modern surgery deals chiefly with gastric physiology; chapter VII with "stomach trouble;" chapter VIII with the mimicry of the symptoms of peptic ulcer; and chapter IX with peptic ulcer and cancer of the stomach. This last is a most interesting account of a case operated on successfully at the very earliest onset of cancerous change, illustrated with very fine photomicrographs. Other chapters deal with the general treatment of cancer, and pre- and post-operative treatment.

Of the more general essays, one on the ideals of a surgeon makes a special appeal for the surgeon not to neglect pathology, and to undertake his share of social duties. "The career of a surgeon" is an address

in which the author emphasizes that the surgeon should not be a mere "cutter"; intelligence, training, and character are all essential. The question "Shall surgeons tell the truth?" is answered in the affirmative. Public health, State medicine, and politics are all dealt with in different essays. And perhaps the most interesting address of all is one on "the fifth estate"—or the world of scientific advancement.

Dr. Horsley's book should make a wide appeal to medical men, for it deals with the broader aspects of medicine and surgery and the effects of scientific research, not only upon medicine, but on human welfare in general.

R. K.

**GERMAN-ENGLISH MEDICAL READER NO. I.**—By Professor G. M. Jadhav. Pp. 155. 1929. Bombay: Times of India Press. Price, not stated.

It strikes the reviewer that this is precisely the book for which a large number of medical men have been waiting for years. Students of medicine in Great Britain learn some French, less Latin, and little Greek. A "classical" education may tend towards a cultured mind, but what the medical man—and above all, the laboratory worker—requires is a good reading knowledge of French and German, also, if possible, of Italian. In common probably with others, the reviewer has from time to time during vacations struggled with popular German grammars, whilst he can usually read medical French easily. The trouble with such popular works as Hugo's, however, is that they are not written from a medical point of view; and the student is left unequipped for technical German medical terms. Yet so much of the most important medical literature of to-day is published in German that that language is almost essential for many medical men.

Prof. Jadhav's method is admirable. On opposite pages, facing one another, are the German and English texts of the same articles. To the medical man who has struggled through a German grammar and gained a very elementary knowledge of the common words in the language, the present work, plus a good—preferably medical—German-English dictionary should give exactly what he requires, a reading knowledge of medical German. The extracts are well chosen; a selection from David Masters' *Conquest of Disease*; translations from Lewis' *Medical Vade Mecum*; an essay on Behring's life work; abstracts from Poulsson's *Pharmacology*; and from Paul de Kruif's *Microbe Hunters*. Thus the author shows a wide and interesting catholicity of subjects.

This is emphatically a book to accompany one on a sea voyage or a summer holiday, and we believe that it meets a very long felt want. The get up and printing are excellent, and we hope that the series will be continued.

R. K.

**MOTHER ENGLAND: A CONTEMPORARY HISTORY.**—By Marie C. Stopes, D.Sc., Ph.D., F.L.C. Pp. 206. London: John Bale, Sons & Danielsson. 1930. Price, 10s. 6d.

We regard this book as one, the publication of which is unhappily necessary. It consists of numerous letters to the authoress from married women in the middle and lower classes, describing their sufferings from too frequent and repeated pregnancies and miscarriages. It is a sad record, but a true one. The letters have been published, unselected, and not edited in any way, except to substitute initials for names, and delete the addresses of the writers. Far too frequently there recurs the statement that the doctor has said that another pregnancy may be dangerous or even fatal, but has not given the patient directions as to how to avoid it. In the final section of the book, Dr. Marie Stopes summarizes in a forcible manner the case for birth control which letters such as these raise.

Medical opinion as to the methods employed for birth control may vary, but we believe that the general consensus of medical opinion is in favour of



birth control under certain circumstances. The present book is one which an opponent of birth control would find it difficult to answer.

If "Mother England" is a sad book, a much more tragic one on similar terms could be written about Indian women. Dirt and ignorance in this country render the problem a hundred times more difficult than it is in Great Britain.

We would advise public health workers and those engaged in women's welfare work in India to study and read this book.

R. K.

**CLINICAL ATLAS OF BLOOD DISEASES.**—By A. Pinoy, M.D., M.R.C.P., and Stanley Wyard, M.D., M.R.C.P. Pp. 99, with 36 illustrations, of which 32 are in colour. London: J. & A. Churchill, 1930. Price, 12s. 6d.

This is a most valuable little book; it is *exactly* what both the laboratory worker and the general practitioner need, a small textbook of hematology, admirably put together, and splendidly illustrated. Both the authors and the publishers are to be congratulated on the abundant and splendid colour plates with which the volume is so richly furnished; they are exactly what the laboratory worker requires to turn to when in difficulties.

The work commences with a useful glossary of terms and coloured schemata of the derivation of the different types of blood cells, illustrated by 8 coloured plates, all of them most faithful reproductions. A page on nuclear indices is then followed by a section of 30 pages with 11 colour plates on the anæmias, every variety of which is considered. The third section of the book deals with changes in the leucocyte picture, 25 pages with 9 colour plates. Next comes a section dealing with blood diseases in which the main incidence of the disease is on the spleen, Hodgkin's disease, Gamna's disease, and the like—10 pages with 3 plates, of which one is in colour. Finally comes the consideration of the so-called hæmorrhagic diatheses—18 pages with 4 plates, of which 3 are in colour. An index is not necessary, for the very complete table of contents at the beginning of the book supplies its place.

The price of the book is exceedingly low, when the excellence of its get up, and the great value of its colour plates is considered. Every laboratory in India should have a copy of this book. Big atlases, such as Pappenheim's, are hard to come by and expensive; the present work, on the other hand, supplies exactly what the laboratory worker requires for study and for constant reference.

R. K.

**CATECHISM SERIES. EDINBURGH: E. & S. LIVINGSTONE.**

(i) **PSYCHOLOGY.**—By J. H. Ewen, M.R.C.S., L.R.C.P., D.P.H. Pp. 72. Price, 1s. 6d.

(ii) **MEDICAL DISEASES OF CHILDREN.**—By D. N. Nicholson, M.B., M.R.C.P. (Edn.). Pp. 74. Price, 1s. 6d.

We have noticed the *Catechism Series* in previous issues. These two new volumes will make a special appeal to medical students, though both may be of interest to general practitioners.

In the first Dr. Ewen summarizes a very difficult subject in a very concise and informative manner. There are brief descriptions of the different tests and instruments used in psychological laboratories, whilst the definition of the very numerous terms used in the science is clear, and will be useful even to the general medical reader who is grappling with the subject.

Dr. Nicholson's book is rather more curt and dogmatic in form. It contains an amazing amount of information in a very small compass. The first chapter on the physiology of infancy will be found useful for reference. The diseases of the different systems are then dealt with in turn, whilst the list of standard prescriptions for children of different ages at the end of the book will be found useful.

## Annual Report.

**ANNUAL REPORT AND STATISTICS OF THE GOVERNMENT GENERAL HOSPITAL, MADRAS, FOR 1928.** BY LIEUT.-COL. J. M. SKINNER, I.M.S., SUPERINTENDENT, MADRAS, 1929, SUPDT., GOVT. PRINTING. PRICE, RS. 3-4-0.

As usual this report is one of great professional interest. In fact one regrets that so much of medical and surgical interest should be buried in an official report, and not submitted for report in the columns of this journal. The Government General Hospital, Madras, however, is to be congratulated on publishing an annual report which is full of professional interest; many of the largest hospitals in India fail to follow this good example.

Following the custom of previous years, the report first deals briefly with general administration, and then goes on to the scientific and professional reports. The total number of patients treated during the year was 74,444 out-patients and 13,819 in-patients. The indoor accommodation was 540 beds, and the Indian male wards were constantly over-crowded during the year. Surgical operations numbered 5,963, and the average stay in hospital for Indians was 8.5 days for medical cases and 11.73 days for surgical cases. During the year cholera cases were admitted—99 cases with 26 deaths—as an emergency measure, until the patients could be taken into the infectious diseases hospital. Twenty-five patients already in hospital, suffering from other diseases, were also attacked in December 1928—January 1929, and most stringent measures had to be taken against the spread of the infection. Enteric cases numbered 305, of whom 76 were Europeans. The number of medical students under instruction was 322, and included 33 lady students, and 15 Anglo-Indian and European students. An improvement effected during the year was to introduce much better lighting throughout the hospital. On the nursing side the year closed with 105 European and Anglo-Indian nurses employed, and 10 Indian nurses; 30 Anglo-Indian pupil nurses and 4 Indian nurses were engaged.

Turning to the professional side of the report, Lieut.-Col. G. E. Malcomson, I.M.S., First Physician, contributes a most interesting summary of nervous diseases as seen in a large Indian hospital. Hemiplegia is the most frequent nervous disease seen, and encephalitis lethargica appears to be on the wane in South India—only four cases having been admitted during the year. Spastic paraplegia cases usually show some evidence of syphilitic origin—a positive Wassermann blood or cerebro-spinal fluid reaction. Sub-acute combined degeneration with severe Addisonian anæmia is far from rare, and is associated with achlorhydria. Acute poliomyelitis is very common. Two patients, both suffering from moderate "pyrexia of uncertain origin," each received by mistake 90 grs. of chloral hydrate; the first died of acute chloral poisoning, the second, who subsequently turned out to be a case of enteric fever, slept soundly throughout the night, awoke next morning very much better, and made a speedy convalescence.

Lieut.-Col. J. M. Skinner, I.M.S., Second Physician, comments on the following unusual cases of dengue:—

*Case 1.*—A European child, of 5 years of age, suddenly taken ill with fever without shivering, and pain in the right iliac fossa. The temperature was 102°F., and continued with irregular slight remissions till crisis on the fifth day. There was no vomiting. The inguinal glands on either side were shotty, but not the cause of the pain. The blood showed leucopenia. On the sixth day a typical dengue rash appeared with slight recrudescence of the fever. The child was brought for consultation because the parents feared appendicitis.

*Case 2.*—A European adult, aged 42, suddenly seized with fever without rigor. The temperature was 103.5°F., and remained high with irregular remissions for ten

days. There were occasional sweats of a drenching character, probably accentuated by aspirin. Headache was severe, mild bronchitis was present, and moderate pains in the body and limbs. There was a history of previous malaria and a just palpable spleen. Blood films showed a marked leucopenia. The symptoms continued until the slow crisis on the tenth day. A slight rash occurred as the temperature fell. Convalescence was rather slow, but there was no recrudescence of the fever.

Case 3. *Latent dengue*.—European male, aged 27 years.

At the conclusion of a race, involving no extraordinary fatigue or strain, this patient suddenly felt giddy and faint and went home to bed. He had had no illness the previous week or before this, and only felt slightly off colour the morning of the sports, but had no definite symptoms he could describe.

On examination the patient was tired and had a slight headache and slight photophobia. The face was flushed, appetite almost unimpaired, the tongue was very slightly coated. The pulse was slow (60), easily compressible. The heart was not enlarged. The sounds at the apex were feeble, and the patient was dizzy whenever he sat up. There was no nausea or vomiting. The temperature was normal.

A typical dengue rash appeared next day with the usual irritability, especially in the palms. There was no fever at any time and the patient rapidly recovered. Two days after this illness began, a second case occurred in the same house, a typical case of dengue.

Dengue without pains is not rare, though not common. Case 4 was typical of dengue except for the absence of pains, even headache. It followed its usual course including the rash and the occasional sweats.

Case 5 was similar except there was no sweating at any time. In the hospital and in the Third District 46 cases were observed including the above cases. The patients seen at home were more disposed to irregularity than the hospital cases, as the latter only came up for treatment when very ill.

Capt. P. N. Basu, I.M.S., Third Physician, gives details of a case of cerebral abscess in the left Rolandic area; also of two cases of chronic *B. coli* infection of the urinary tract. These latter cases were characterized by chronic fever with leucopenia, absence of signs and evidence of tuberculosis of the lungs, and a negative Widal reaction. Intravenous injections of hexamine led to rapid improvement.

The same author also contributes the following interesting notes on "inanition diarrhoea":—

"Under the above title we have grouped together a type of chronic diarrhoea with certain well defined pathological features.

There were five cases of diarrhoea belonging to this type. The cases came into hospital with chronic diarrhoea and emaciation. Very often the clinical diagnosis was that of tubercular enteritis. Mouth lesions characteristic of sprue were absent. The copious frothy acid evacuations of sprue were also not in evidence.

Autopsy showed no evidence of active tubercular disease anywhere. Severe emaciation was a noticeable feature. General atrophy of all the organs was another feature. This corresponds to types of starvation-atrophy of all the organs with brown atrophy of the heart. There were slight serous effusions into all cavities. The small intestine usually showed moderate atrophy, most marked near the ileo-caecal junction and even extending to the large intestine. The thin diaphanous condition that is described in cases of sprue was never met with. The condition of the adrenals was variable but atrophy was not a feature, though the hypertrophy described by McCarrison in case of starvation oedema was not met with.

Microscopical examination of the intestine showed a general atrophy of all the coats and not confined particularly to the mucous membrane. This would suggest some disturbance of the general nutrition accounting for the diarrhoea rather than local disease

of the mucous membrane. Necrosis of the mucous membrane, fibrosis or round-celled infiltrations of the submucosa, conditions met with in inflammatory disease of the intestine were not in evidence. In the absence of bacteriological data it is not possible to exclude chronic food poisoning, but even here irritative and inflammatory reactions of the mucous membrane would be in evidence. Gee's coeliac disease presents similar histological features in the intestine but some regard this as a type of 'sprue'.

Pending further investigation these cases have been brought together as types of 'inanition diarrhoea'.

Capt. Basu and Dr. A. Vasudevan comment on the great frequency of primary carcinoma of the liver in Madras. Primary carcinomata of the liver are to secondary carcinomata as 1.45 : 1. The primary carcinoma affects the hepatic cells more often than the columnar cells of the bile ducts, and both are associated with multilobular cirrhosis.

Dr. M. R. G. Mudaliyar, Fourth Physician, gives details of a case of miliary tuberculosis in a Hindu clerk, aged 25, simulating enteric fever. At post-mortem examination miliary tuberculosis of the lungs and liver was found, together with deposits in the right cerebral peduncle and on the ventral aspect of the pons. A patient who was given 3 ozs. of fresh melon seeds, mashed and mixed with sugar and water, passed nine complete tapeworms during the course of the next day. Tests of samples of pituitrin showed that time-expired samples had no therapeutic effect, or very little; seven time-expired samples were tested with very poor results. Oral administration of musk was found to rapidly raise the leucocyte count, the count sometimes being doubled within two hours.

The First Surgeon reports 11 cases of tetanus, of which 4 died. Intrathecal injections of anti-tetanic serum appeared to be followed by hyperpyrexia. In the treatment of burns aqueous 2½ per cent. tannic acid plus radiant heat appeared to give better results than picric acid. The following notes on radium treatment of cancer of the mouth and throat are given:—

"During the year 28 cases of inoperable cancers were treated with radium implantation or surface application or both, and as many as 20 cases were distinctly relieved. In almost all these cases in addition to marked relief of pain, salivation and foetor, there was noticeable shrinkage in the growth itself. While it is premature to claim any complete cures, the marked benefit obtained in such obviously inoperable and advanced cases leads one to hope that with increased experience in dosage, distribution and knowledge of clinical response to treatment, still better results could be obtained in future. Lingual cancers in particular appear to respond more quickly to radiation than primary cancers affecting the cheek and jaw, while next in order of susceptibility to irradiation are malignant growths affecting the lips and pharynx. The softer, more cellular and more rapidly growing tumours show particularly rapid improvement, while the chronic old slow-growing fibrosis ones are least benefited by irradiation. Another important feature noted was the comparative lack of response to radium therapy on the part of glandular metastases while the primary growth itself showed marked retrogression.

In this connection radium therapy has been found to be of very exceptional value in the treatment of rapidly growing soft cellular sarcoma, and more particularly those affecting the lymphatic system, the lymphosarcomata and the small round celled sarcomata. There is at present a case under radium treatment where a man who had a huge sarcomatous growth affecting the axillary glands and infiltrating the chest wall and shoulder showed absolute disappearance of the growth to the naked eye within 15 days of one intensive application of radium to the mass. This case is still under observation."

#### *Cancers of the Cheek.*

Dr. Sabesan, who has been collecting statistics of such cases, published an article in the August issue of the *Madras Medical College Magazine*, 1928, and some

of his observations are reported here, as they appear to require further investigation and enquiry.

"Cases admitted in Third Surgeon's ward from April 1924 to December 1927. During this period 57 cases were admitted, out of which 43 were on the left side, and the usual site of onset appears to be in the crypt formed by the reflection of the mucous membrane from the alveolar margin of the lower jaw on to the cheek. Even here there appears to be a greater frequency of onset near the first molar tooth. An enquiry into the habits of these patients reveals that every one of them is in the habit of chewing betel leaves with areca nuts and lime, and keeping a quid of tobacco in the mouth—the usual place of its retention being in the pouch of mucous membrane between the mucoperiosteum lining the root of the first molar tooth and the mucous membrane of the cheek adjoining. Even though it has been generally recognized by Madras medical men that the chewing habit predisposes to the development of cheek cancer I am not aware of any detailed enquiry into the exact nature of the real ingredient which acts as the irritant. Some one suggests that it is the lime that is responsible for the chronic irritation while others consider that the tobacco is the real irritant. When one considers that the habit of chewing is almost universal amongst the South Indians, while only comparatively a small percentage of betel chewers keep a quid of tobacco in their mouth and that the majority of the people suffering from cheek cancers are in the habit of keeping a quid of tobacco, it is obvious that neither the betel nor the lime is the chief irritant but rather the tobacco or some compound formed by the chemical interaction of its juice with the betel juice. It is not really the habit of chewing that is probably responsible for the chronic irritation, but the constant pressure of the irritant betel-nut-lime-tobacco-mixture, which is kept stowed away in the mouth cavity practically all the hours of the day."

Major K. G. Pandalai, I.M.S., Second Surgeon, contributes the following notes with regard to peptic ulcers.

One hundred and sixty-eight cases of peptic ulcers were treated in my wards by operation during the year 1928. This number is in excess of the average of previous years and indicates that the stream of patients afflicted with the disease continues to pour into the General Hospital from the mofussil. As time passes one notices that the average age of patients treated has a tendency to decrease; instead of old and comparatively bad surgical risks, we are receiving numbers of younger and healthier patients ready to undergo the risks of a serious abdominal operation rather than rely on the doubtful benefits of prolonged medical treatment.

Among these cases are seen a proportion, about 5 per cent., of patients who have had previous operations for the disease, either in this hospital or elsewhere, performed at periods varying from a few weeks to four or five years. These cases of recurrence have had the effect of shaking one's faith in the infallibility of the customary surgical treatment, viz., gastro-enterostomy, generally employed in this disease. The tendency now is in two directions, first to insist on a more strict and prolonged dietetic and medicinal regime subsequent to operation; secondly, the operation itself is tending to be radical, viz., in the direction of partial gastrectomy. It is too early yet to say what the final results of the latter method would be. The total number treated by partial gastrectomy in my wards during the year was 29. Although the primary mortality hitherto has been comparatively high, there have been no recurrences of the original disease. From the experience already gained it may be said without hesitation that when dealing with cases of gastric ulcers, if a patient will stand the operation, if the technical difficulties are not insuperable and if the surgeon has the necessary experience, the radical operation of partial gastrectomy is the ideal method of treatment. But when conditions are adverse, even gastro-enterostomy in peptic ulcers of the stomach gives excellent results if followed by careful and prolonged medical treatment. In cases of duodenal ulcer, the operation of partial gastrectomy combined

with the removal of the pylorus and the first part of the duodenum, is a tedious operation and it is doubtful if at any time the suggested method of duodenectomy for these cases would become the method of choice. Bleeding from the numerous pancreaticoduodenal vessels holds up the surgeon at every step, and in cases with considerable scarring there is present the risk of leaving patches of duodenal mucous membrane behind or damaging the common bile duct.

When treating these cases of recurrence one finds at a second laparotomy that there is nearly always a gastro-jejunal ulcer. The treatment adopted in these cases has been that of undoing the original anastomosis, partial gastrectomy, closure of the pyloric end of the duodenum and an anastomosis between the stomach and jejunum a little lower down. In this operation difficulties have been encountered in a few cases.

Gall-stones associated with duodenal ulcers are well known. There have been a few cases of gall-stones obstructing the common bile duct in addition to duodenal ulcers. In such cases, after a gastro-jejunostomy it has been found necessary to effect permanent drainage of bile through the bile duct into the duodenum by leaving in the common bile duct a rubber catheter, size No. 12, and closing the common duct over it in layers. Two such cases have occurred, and in one, which was done about 15 months ago, there is yet no report from the patient as to his having passed the tube.

From these cases it would seem that the presence of rubber tubes in the jejunum or bile duct does not give rise to trouble and that the method may safely be adopted to provide for continuous drainage within the abdomen on occasions when otherwise, external drainage or an anastomosis would be the only possible alternatives.

Rao Bahadur Dr. G. V. James, M.D., Third Surgeon, gives details of the following cases:—

1. *A case of Perthe's disease.*—A Hindu female child, aged 10 years, was admitted on 13th April, 1928, for pain in the right hip joint, result of a fall sustained some time previously. Extension of joint was slightly restricted. Skiagram showed a peculiar mushrooming of the head of the femur on the right side and the angle of the shaft with the femoral neck was widened out—a condition suggestive of Perthe's disease. The limb was put up in plaster of Paris spica with extension. The condition rapidly improved and she was discharged with considerable relief of symptoms.

2. *A case of what appeared to be diffuse lipoma of scalp.*—Mr. A., aged 22 years, male, Hindu, was admitted on 15th September, 1928, for a tumour about the size of a walnut of 8 years' duration in the scalp just behind and below the right mastoid. Lately he had pain in the tumour area, especially on moving the neck. The tumour was growing in size very slowly. It had a lobulated feel, adherent to the skin in some areas. Fluctuant, slightly movable over the deep structures of the scalp. No history of trauma or abscess formation or any other trouble in the area. There was no pulsation, expansile or otherwise, no impulse on cough. Pressure caused no change in the size. On auscultation no bruit was heard. On shaving the scalp, a somewhat greater area than what was apparent at first was found to be involved in the tumour. The most probable diagnosis was diffuse lipoma of the scalp.

On cutting down over the tumour a blackish mass in connection with the posterior edge of the sternomastoid and splenius-capitis with inflammatory adhesions around presented itself. It was then suspected to be a case of diffuse pathological aneurysm of an artery in the area, and on incising the sac blood clot blood was removed. The sternomastoid was separated from the mastoid and the occipital artery was found bleeding into the sac. On trying to control the bleeding locally the artery gave way wherever it was clamped. Local pressure against the mastoid controlled the bleeding, and an incision anterior to the sternomastoid was made. The upper part of the wound here also showed a blackish staining, suggesting an extension of the aneurysm forward. The external

carotid artery was isolated and ligatured. The aneurysmal cavity was plugged with gauze and the wound closed. The wound healed and the patient was discharged cured three weeks later.

3. A chronic guinea-worm abscess of the abdominal wall.

Patient, aged 10 years, male, Hindu, was admitted with a tumour of the size of an orange of 9 months' duration, in the anterior abdominal wall in the left hypochondriac region. The skin was freely movable over it. It was distinctly circumscribed, lobulated, not quite cystic but soft. It did not move with respiration; had no resonance in front; had no connection with the spleen, iliac bone, spine or ribs. It was fixed to the external oblique fascia. The most probable diagnosis was a myo-sarcoma from the external oblique fascia.

On opening, it turned out to be a chronic abscess between the external and internal oblique. The muscles contained 10 ounces of pus. Bits of a dead worm, probably a guinea-worm, came out. The cavity was plugged with iodoform gauze and closed.

Pathological report. Guinea-worm. The tumour therefore turned out to be a chronic guinea-worm abscess in a rather unusual situation.

In the Ear, Nose and Throat Department, Dr. P. V. Cherian, F.R.C.S., dealt with 26,625 patients in all, and carried out 681 operations. Tonsillectomy heads the list, followed by submucous resection of the nasal septum. Mastoid operations totalled 61. He contributes the following notes:—

*Rhinosporidium Kincalpi*.—Sir St. Clair Manson in his book on *Diseases of the Nose and Throat*, 1926 edition, says about *rhinosporidiosis*. "All recorded cases so far have been in males." But in March 1928 a Malabar lady, Kunji Kuttiammal, aged 33, was admitted into my wards for a growth in the nose. This was of 15 years' duration and had been operated on ten times during that period. There was a pedunculated growth arising from the floor of the right nostril. A portion of the growth was projecting in front occluding the right nostril. The main mass of the growth however was behind and on opening the mouth a pedunculated mass was seen hanging behind the soft palate. There was also a small growth of the same kind absolutely separate and attached to the left posterior pillar of the fauces. The growths were characteristic, with several spots on the surface. The clinical diagnosis of *rhinosporidiosis* was confirmed by the pathologist. The growths were removed surgically, when it was found necessary to split the soft palate to remove the entire growth. The bases were cauterized. Up to date the growth has not recurred and it is not likely to recur as the surgical removal was thorough. Several attempts at cultivation during the year failed.

One case of great interest that was admitted during the year was that of a boy aged six years with a safety pin in the larynx. The pin was in the larynx for about two months. The history was that the child swallowed the safety pin while playing with it. The parents gave the child purgatives, but the foreign body was not found in the stools. The child's voice was getting hoarser and when he arrived in Madras, he was practically voiceless. The pin could not be seen on indirect laryngoscopy as the larynx was full of foul secretion. X-ray examination showed the safety pin open with the point upwards in the larynx opposite the 4th, 5th and 6th cervical vertebrae. The child was then anaesthetised and on introducing Hassinger's directoscope and cleaning the larynx, the rusty safety pin was visible wedged in between the vocal cords. Both vocal cords were inflamed and ulcerated. No attempt was made to close the open safety pin as there was danger of breaking it. An ordinary straight hook—Irwin Moore's—was introduced through the directoscope and the pin was removed with the greatest ease. The child remained in the hospital only for a few more days after removal of the pin, but on discharge the voice had improved considerably.

In the Venereal Department, under the charge of Dr. W. Happer, Ch.B., M.D., M.R.C.P., 638 patients were

dealt with. General out-patients for the year totalled 74,444. Antirabic patients numbered 451, and of these 388 completed the course of antirabic treatment. The newly created Bacteriological Laboratory had a very large scope of work, from agglutination reactions, the preparation of autogenous vaccines, to tests for the sterility of catgut and examinations for relapsing fever. The Government X-Ray Institute, under Capt. T. W. Barnard, showed no less than 67,063 patients dealt with during the year, and deals with patients sent from hospitals scattered all over the Madras Presidency. Here much therapeutic work is carried out, as well as diagnostic routine, and this centre constitutes one of the most important radiological centres in India. Radiologists would do well to read Capt. Barnard's report in the original.

## Correspondence.

### THE KURCHI TREATMENT OF AMOEBIC DYSENTERY.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I note that in Dr. Majumdar's article on the use of kurchi bark in dysentery in the February number of the *Indian Medical Gazette*, he states that Acton, Knowles and Chopra are to be congratulated on having established, on a scientific basis, the value of this time-honoured remedy for dysentery in India, and concludes that in kurchi we appear to possess the ideal remedy for intestinal amoebiasis.

My interest in kurchi originated during clinical tests with this drug in Jullundur in 1911.

In 1922 (*British Medical Journal*, Vol. I, p. 993), I gave an account of the action of conessine upon free-living amoebae and showed that the action on these organisms was very similar in degree to that produced by emetine. The protozoocidal action of conessine and the associated tannins has also been investigated by Dr. T. A. Henry and myself, *Trans. Roy. Soc. Trop. Med. and Hyg.*, 1923, XVII, p. 61 and p. 378. As the direct result of this research a supply of Kurchi Tabloids was sent to Major Knowles in September 1924, with a request that he should test them in cases of amoebic dysentery.

His preliminary account of the trial of this drug, brought to his notice by the above investigation, was described by him in the annual report of The Calcutta School of Tropical Medicine, 1924.

It would appear that the recent work in Calcutta on the subject of Kurchi originated from this date, but there is no mention of this in Dr. Majumdar's article on the subject and no reference is made of the work of Burn, *Jour. Pharmacology*, 1915, VI, p. 305, on the physiological action of conessine or to that of Pyman, *Trans. Chem. Soc.*, 1919, CXV, p. 163, on the chemical properties of the contained alkaloids.—Yours, etc.,

H. C. BROWN,  
MAJOR, I.M.S. (Retd.),

THE WELLCOME BUREAU OF  
SCIENTIFIC RESEARCH,  
LONDON, W.C. 1,  
12th March, 1930.

### BLUNDERBUSS THERAPY.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—May I crave the indulgence of a little space in your journal to bring to the notice of the medical profession in India at large an instance (which must be one of thousands) of negligent practice by our noble profession?

My daughter, aged 17, was married in December last. After a month's residence with her husband she became seriously ill. News being received a month later that her state was critical, my wife proceeded to Barisal to bring the girl back here so that I might treat her myself.

During this time she had been under the treatment of an M.B. of an Indian university. This man made no attempt to diagnose the case by any orthodox methods, and evidently believed in "shot-gun" treatment.

First, he prescribed the noisome concoction given below for no apparent reason:—

R Hexamina ..	..	gr. x.
Glycothymoline ..	..	gr. vi.
Sodii benzoas ..	..	m. xx.
Tinct. carminativa ..	..	m. iv.
Tinct. scillae ..	..	m. xv.
Thiocol (Roche) ..	..	gr. viii.
Syr. vasaka et tolu ..	..	℥i.
Aqua chloroformi ..	..	℥i.

One such dose thrice daily. Later there was added to the above mixture:—

Extract. kalmagh. liquid ..	..	℥i.
Syr. caseara arom. ..	..	℥ss.

Together with this prescription the following powders were ordered:—

R Sodii-sulphocarbolas ..	..	gr. vi.
Dimol ..	..	gr. viii.
Orphal ..	..	gr. i.
Pulv. ipecac. ..	..	gr. 4.
Kaolina pulv. ..	..	gr. x.

One such powder twice daily. The Orphal was omitted after the second day.

Next, as the girl had been born and had been resident in Assam, on this ground alone he gave her three injections of urea-stibamine, thereby producing abscesses. The patient was meanwhile getting worse, and was also being starved at the orders of the said M.B., who incidentally charged a very heavy rate of fees.

By the time my daughter arrived here, after thirty odd days of fever, she was in an extremely critical condition. I at once called in the help of the European district medical officer, who immediately established the diagnosis of heavy malignant tertian malaria microscopically. Examination of the stools showed an infection with *Trichomonas hominis* (a harmless commensal of the intestinal tract), and nothing else. Quinine treatment was promptly administered in large doses with an immediate effect in the reduction of temperature and general improvement for a few days. Unhappily, at this stage the patient was overcome by a severe and fatal attack of lobar pneumonia, thus terminating the course of a very sadly neglected case.

Such neglect and blunderbuss treatment brings the greatest discredit on the medical profession. The medical register is disgraced by the inclusion of such men in its pages. Further, a second scandal is the number of men who qualify but never register at all. It is to be hoped that other such cases will be reported in your columns to bring to light the almost universal custom of shot-gun "treatment." It would clear the atmosphere considerably if the Medical Councils could take action in such instances.

My deepest gratitude is due to the District Medical Officer and the Manager of this estate, who did their best to save the life of my daughter. Unfortunately it was too late for them to do anything.

Thanking you for the courtesy of publication.—Yours, etc.,

DURGA CHARAN CHATTERJI, L.M.S.,  
Medical Officer.

HALEM TEA CO., LTD.,  
HALEM P. O., DARRANG, ASSAM,  
25th March, 1930.

## THE TREATMENT OF ACUTE INTESTINAL OBSTRUCTION.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—On p. 178 of your issue for March 1930, Lieut.-Col. R. C. M. McWatters, I.M.S., refers to the treatment

of acute intestinal obstruction where operation is refused. I should like to mention the line of treatment which I successfully adopted in five such cases that came under my care between 1927 and 1930, only one of which had to be operated on.

Case 1.—The condition was of 36 hours' duration. The relatives were warned that there was imminent necessity for an operation the next morning, when, to the surprise of myself and the relatives, the patient had a large, loose evacuation at 3 a.m., and was immediately relieved.

Cases 2 and 3.—These were of from 12 to 24 hours' duration, and in both the treatment was successful.

Case 4.—This was a weakly old man of 65, with obstruction of at least 3 days' duration, and a very feeble and thready pulse. He was in a semi-comatose condition, with a clammy skin. Eleven hours after the institution of treatment he had a spontaneous evacuation, and promptly recovered.

Treatment.—In all these cases I gave 1 c.c. of pituitrin and 1/100th gr. of atropine sulphate hypodermically at once. Turpentine and soap and water enemata were given from time to time, and turpentine stupes to the tumid abdomen frequently. I also gave orally

R Tinct. asafoetida ..	..	m. x.
Tinct. belladonnae ..	..	m. x.
Mist. Olei ricini ..	..	℥i.

every two hours until the bowels were opened.—Yours, etc.,

A. S. VAIDYANAT IYER,  
Medical Practitioner.

TELLIDEVY,  
11th April, 1930.

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

IN pursuance of the provisions of sub-rule (2) of rule 26 of the Council of State Electoral Rules, the Governor-General is pleased to nominate Major-General J. W. D. Megaw, C.I.E., being an official, to be a member of the said Council of State.

### To be Honorary Surgeon.

Colonel E. A. Walker, M.B., F.R.C.S.E., I.M.S. Dated 1st April, 1930, vice Colonel A. B. Fry, C.B., C.I.E., D.S.O., M.D., I.M.S., retired.

The services of Colonel C. A. Sprawson, C.I.E., M.D., F.R.C.P., V.H.S., I.M.S., Inspector-General of Civil Hospitals, United Provinces, are lent temporarily to the Government of Nepal, with effect from 10th February, 1930.

Lieutenant-Colonel H. B. Steen, M.D., I.M.S., Officiating Professor of Clinical and Operative Surgery, Medical College and Surgeon to the College Hospital, Calcutta, is appointed until further orders to officiate as Surgeon-General with the Government of Bengal, with effect from the 15th March, 1930.

Lieutenant-Colonel W. Tarr, I.M.S., Civil Surgeon, Nagpur, is appointed to officiate as Inspector-General of Civil Hospitals, Central Provinces, during the absence on leave of Colonel W. V. Coppinger, C.I.E., I.M.S.

Lieutenant-Colonel W. A. Mearns, M.A., M.B., D.P.H., I.M.S., Assistant Director of Public Health, II Range, to officiate as Director of Public Health, United Provinces, vice Lieutenant-Colonel C. L. Dunn, granted leave.

Lieutenant-Colonel C. A. Gill, I.M.S., Director of Public Health, Punjab, is appointed to officiate as Inspector-General of Civil Hospitals, Punjab, during the absence on leave of Colonel H. M. Mackenzie, M.B., I.M.S., with effect from the date on which he assumes charge of his duties.



Lieutenant-Colonel C. Newcomb, I.M.S., on reversion to the Madras Civil Medical Department, to resume his appointment as Professor of Chemistry, Medical College, and Chemical Examiner to Government.

Lieutenant-Colonel D. P. Gail, M.B., F.R.C.S.E., I.M.S., Civil Surgeon, Howrah, is appointed as Principal, Medical College, Calcutta, and Superintendent, Medical College Hospitals, temporarily for two years, with effect from the 1st March, 1930, *vice* Lieutenant-Colonel A. D. Stewart, I.M.S.

Lieutenant-Colonel R. G. G. Croly, I.M.S., to act as Surgeon, IVth District, Superintendent, Government Royapettah Hospital, and Professor of Medical Jurisprudence, Medical College, Madras.

Lieutenant-Colonel F. E. Wilson, I.M.S., an Agency Surgeon, is posted as Chief Medical Officer in the Western India States Agency and Residency Surgeon, Rajkot, with effect from the 27th March, 1930.

In supersession of Education, Health and Lands Departments, Notification No. 2497-Health, dated the 19th December, 1929, Lieutenant-Colonel V. N. Whitamore, O.B.E., F.R.C.S. (Edin.), I.M.S., is appointed to be Civil Surgeon, Simla West, with effect from the 3rd March, 1930.

Lieutenant-Colonel H. C. Buckley, M.D., F.R.C.S.E., I.M.S., Civil Surgeon, Lucknow, was appointed to officiate as Inspector-General of Civil Hospitals, United Provinces, in addition to his own duties from the 10th to the 27th February, 1930 (both days inclusive), during the absence of Colonel C. A. Sprawson, C.I.E., M.D., F.R.C.P., V.H.S., I.M.S., on "Foreign Service" in Nepal.

Lieutenant-Colonel C. A. F. Hingston, C.I.E., O.B.E., I.M.S., Principal and Professor of Midwifery, Medical College, Madras, is appointed to officiate temporarily as Surgeon-General with the Government of Madras, in addition to his other duties, with effect from the date on which he assumes charge and until further orders.

Major J. A. Sinton, V.C., O.B.E., I.M.S., an officer of the Medical Research Department, is placed on foreign service under the Indian Research Fund Association, with effect from the 1st March, 1930.

The services of Major H. H. Elliot, M.B.E., M.C., M.B., F.R.C.S.E., I.M.S., are placed at the disposal of the Government of India in the Foreign and Political Department, with effect from the forenoon of the 4th March, 1930.

Major M. G. Bhandari, I.M.S., on return from leave to be Superintendent and Medical Officer, Nasik Road Central Prison.

The services of Major R. A. Logan, I.M.S., are placed temporarily at the disposal of the Government of Central Provinces, with effect from the date on which he assumes charge of his duties.

Major S. N. Mokand, M.B., I.M.S., is appointed to officiate as Health Officer, Simla, with effect from the 22nd February, 1930, until further orders.

Major A. C. Craighead, M.B., I.M.S., is appointed temporarily to officiate as Director, Pasteur Institute of India, Kasauli, until further orders, during the absence on leave of Major R. H. Malone, I.M.S.

Major K. V. Ramna Rao, M.R.C.S., L.R.C.P., L.M.S., District Medical Officer, Kistna, to be in full additional charge of the office of the District Health Officer, Kistna, with effect from 21st January 1930 afternoon to 3rd February 1930 afternoon.

Major P. Verdon, I.M.S., to do duty at the Government Hospital for Women and Children, Madras, until further orders.

The services of Major R. S. Aspinall, I.M.S., an Agency Surgeon, are placed at the disposal of the Government of India in the Department of Education, Health and Lands, with effect from the 4th March, 1930.

#### LEAVE.

In modification of previous orders Colonel W. V. Coppinger, C.I.E., D.S.O., M.D., F.R.C.S.I., I.M.S., Inspector-General of Civil Hospitals, Central Provinces, is granted leave on average pay for 3 months and 21 days combined with leave on half average pay for 3 months and 9 days, with effect from the 20th March, 1930.

Colonel H. M. Mackenzie, M.B., I.M.S., Inspector-General of Civil Hospitals, Punjab, is granted leave on average pay for 2 months and 16 days combined with leave on half average pay for 2 months and 9 days, with effect from the 14th May, 1930, or subsequent date from which he may avail himself of the leave.

Lieutenant-Colonel C. L. Dunn, C.I.E., D.P.H., I.M.S., Director of Public Health, United Provinces, leave on average pay for 7 months and 15 days combined with leave on half average pay for 20 days from the 11th March, 1930, or the date of availing.

Major F. J. Anderson, I.M.S., is granted leave on average pay for 3 months and 20 days from the 14th April to the 2nd August 1930 inclusive, with permission to affix the holiday on the 3rd August 1930 to his leave subject to the conditions laid down in the subsidiary rules under Fundamental Rule 68.

Major R. H. Malone, M.B., I.M.S., Officiating Director, Pasteur Institute of India, Kasauli, is granted leave on average pay for 8 months combined with leave on half average pay for 4 months, with effect from the 13th March, 1930, or any subsequent date from which he may avail himself of the leave.

In modification of E. H. & Lands Department Notification No. 1580-Health, dated the 15th August, 1929, Major S. M. Hepworth, M.B., I.M.S., Acting Superintendent, X-Ray Institute, Dehra Dun, is granted leave on average pay for 1 month and 2 days combined with furlough on private affairs for 10 months and 29 days under military rules, with effect from the 5th August, 1929.

Major C. de C. Martin, I.M.S., Officiating Assistant Director, Central Research Institute, Kasauli, is granted leave on average pay for 2 months, with effect from the 1st April, 1930, or any subsequent date of availing and his services are placed at the disposal of the Government of Burma on the expiry of his leave for appointment as Pathologist at the General Hospital, Rangoon.

Major J. B. Hance, I.M.S., an Agency Surgeon, is granted leave on average pay for 8 months, under the Fundamental Rules, with effect from the 27th March, 1930.

In supersession of Education, Health and Lands Department Notification No. 604-II, dated the 13th March, 1930, Major R. H. Malone, M.B., I.M.S., Officiating Director, Pasteur Institute of India, Kasauli, is granted leave on average pay for 8 months combined with leave on half average pay for 4 months, with effect from the afternoon of the 10th March, 1930.

Captain H. W. Mulligan, M.B., I.M.S., Supernumerary Officer, Central Research Institute, Kasauli, is granted leave on average pay for 2 months and 4 days, with effect from the 12th February, 1930 (afternoon), and his services are placed at the disposal of the Army Department from the 17th April, 1930.

#### PROMOTIONS.

##### *Colonel to be Major-General.*

W. C. H. Forster, M.B. Dated 5th November, 1929, *vice* Major-General R. W. Anthony, C.I.E., M.B., F.R.C.S.E., retired.

##### *To be Colonels.*

Lieutenant-Colonel L. J. M. Deas, M.B., F.R.C.S.E. Dated 1st January, 1928, with seniority from 3rd June, 1921.

Lieutenant-Colonel M. MacKellvie, C.I.E., M.B., F.R.C.S.E. Dated 8th September, 1927, with seniority from 1st January, 1922.

Bt.-Colonel W. H. Leonard, F.R.C.S.E., R.H.P. Dated 10th June, 1929, with seniority from 1st January, 1922.

Bt.-Colonel W. D. A. Keys, C.I.E., M.D. Dated 11th March, 1928, with seniority from 1st July, 1927.

Bt.-Colonel E. A. Walker, M.B., F.R.C.S.E. Dated 2nd September, 1929, with seniority from 1st July, 1928.

This supersedes the previous orders on the subject so far as they relate to the above mentioned officers:—

##### *Lieutenant-Colonel to be Colonel.*

J. Husband, M.B., F.R.C.S.E. Dated 22nd February, 1930.



*Major to be Lieutenant-Colonel.*

R. de S. B. Herrick, D.S.O. Dated 30th January, 1930.

*Captains to be Majors.*

A. V. Lopes. Dated 2nd November, 1929.

I. S. Nalwa, M.B. Dated 16th November, 1929.

D. R. Thapar. Dated 25th September, 1929.

The promotion of the undermentioned officers to the rank of Major is antedated to the dates noted:—

A. H. Hanty. Dated 7th February, 1926.

L. G. Pearson, M.B. Dated 18th November, 1928.

*Lieutenant to be Captain.*

P. J. Kelly. Dated 7th March, 1930.

*Lieutenant to be Captain (Provisional).*

K. F. Alford. Dated 6th January, 1930.

*To be Captain (on probation).*

J. A. W. Ebdon, M.D., M.S., F.R.C.S., 6th December, 1929, with seniority 20th January, 1931.

## RETIREMENTS.

Lieutenant-Colonel F. V. O. Beit, M.D., I.M.S., 14th August, 1929.

Lieutenant-Colonel J. W. Barnett, M.B., 3rd February, 1930.

Lieutenant-Colonel F. H. Stewart, O.B.E., M.B., 5th February, 1930.

Major G. Y. Thomson, M.B., I.M.S., 27th February, 1930.

## RESIGNATIONS.

The Governor-General is pleased to accept the resignation by the Honourable Major-General Sir Henry Symons, K.B.E., C.S.I., O.B.E., K.H.S., of his office of Member of the Council of State.

## NOTES.

## BRITISH INDUSTRIES FAIR.

Organized by London 17th to 28th February, 1930.

WELLCOME & Co. EXHIBIT.

THE Burroughs Wellcome & Co. display embraced a comparative series of fine chemicals, galenicals and other pharmaceutical products.

A striking display of crystals introduced a novel feature to the exhibit. Visitors could not but be impressed by the exquisite form and variety of the crystals, which provided an object-lesson in crystallography. In the majority of cases the crystals were displayed as they actually separate from solution. In other instances, individual crystals indicated the form in which they grow under ideal culture. Amongst the organic chemicals were included several in brilliant colours and shapes of great beauty. A particularly interesting exhibit was crystalline insulin prepared at the Wellcome Chemical Works from the insulin hydrochloride used in the preparation of "Wellcome" brand insulin.

Prominent amongst the chemicals were "Wellcome" brand bismuth carbonate, and sodium salicylate. The former salt, which contains less nitrate and less alkali carbonate than the ordinary pharmacopœial salt, is aptly described as "better than B. P." The latter is issued in powder and in flake and forms a bright and colourless solution in water (25 per cent.).

In view of the instability of the majority of digitalis preparations, it is important to mention that "Diginutin," a solution of the total glucosides of digitalis leaves freed from inert vegetable matter, is quite stable and may be used with advantage in place of the tincture.

The desirability of using exclusively the levo-rotatory natural ephedrine alkaloid in asthma, hay-fever and other bronchial conditions is now admitted. Burroughs Wellcome & Co. have invariably used the levo-rotatory alkaloid when preparing their ephedrine products.

A display of "Kepler malt extract" (an important source of Vitamin B), and "Kepler cod-liver oil with

malt extract" (in which active Vitamins A, B and D are presented in their natural form and association) helped to remind visitors that the reputation of "Kepler" products was established many years before vitamins were discovered and it is satisfactory to note that a scientific explanation of their therapeutic efficiency has been accepted.

## WORKMEN'S COMPENSATION IN INDIA.

RECENT legislation has very materially altered conditions with regard to workmen's compensation in this country, and such legislation is of importance to the medical practitioner in India, who may have to issue medical certificates, give professional evidence, or in other ways become concerned in this matter.

In this connection we have received a small brochure from the Calcutta Claims' Bureau, 26, Dalhousie Square, Calcutta, which gives a succinct but useful summary of the present laws on the subject. This may be of interest to many of our readers. Copies can be obtained from the above address.

## WATSON'S MICROSCOPE RECORD.

WE have several times drawn the attention of laboratory workers among our readers to this excellent little journal, issued by W. Watson & Sons, Ltd., 313, High Holborn, London, W.C. 1. A recent issue received—No. 18—contains much useful information of a type which one does not often get in ordinary laboratory textbooks and manuals. Dr. W. D. Grier, F.R.M.S., deals with the microscopy of rayon, (artificial silk); there is an account of a simple apparatus for vertical photomicrography; Mr. D. L. Bryce, F.R.S.E., F.R.M.S., contributes a study of the rotifers of bogs and boggy pools. Perhaps the most useful section in the number is one by A. A. C. Eliot Merlin on hints to beginners in microscopy. The article by Mr. J. E. Barnard, F.R.S., on setting up the microscope for dark-ground illumination will also be very useful to laboratory workers. The "Notes and Queries" section is also of interest.

Laboratory workers in this country would do well to ask for copies of this small and well run journal, for it contains much useful information.

## Publishers' Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 reprints *gratis*, if asked for at the time of submitting their manuscripts.

Communications on Editorial Matters, Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o The Calcutta School of Tropical Medicine, Central Avenue, Calcutta.

Communications for the Publishers relating to Subscriptions, Advertisements, and Reprints should be addressed to THE PUBLISHERS, Messrs. Thacker, Spink & Co., P. O. Box No. 54, Calcutta.

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## Original Articles.

### A PRELIMINARY NOTE ON ADDICTION TO "POST" (UNLANCED CAPSULES OF *PAPAVER SOMNIFERUM*).\*

By R. N. CHOPRA, M.A., M.D. (Cantab.),  
LIEUTENANT-COLONEL, I.M.S.,

Professor of Pharmacology, Calcutta School of Tropical  
Medicine and Hygiene.

Drug Addiction Series No. 6.

*Historical and General.*—The properties and uses of the capsules of the opium yielding *Papaver* were known long before the Christian era. Various species of the poppy have been cultivated as ornamental garden plants and have been mentioned by writers from the earliest times. There is little doubt that the merits of the seeds as a food were recognised much earlier than the somniferous property of the capsules, and it is also certain that the soporific and narcotic properties of the capsules themselves were appreciated long before their recognition in its milky sap. The capsules have been employed in the preparation of soporific drugs or in the preparation of stimulating and soothing beverages from time immemorial. According to Watt, *Papaver somniferum* was grown in Asia Minor many centuries ago for its capsules, and the Arabs carried the dried poppy heads to the eastern countries including China, even before the inspissated juice was taken and its properties made known to the inhabitants of those regions. The medicinal properties of the plant and its capsules were fully known during the early classic period of Greece and Rome. The Egyptians had been using poppy capsules long before the 1st century A.D. The early Chinese works mention the Arabs exchanging poppy heads with Chinese merchants. There are records to show that the Arabs instructed the Chinese to prepare from these capsules, a soporific beverage and medicine before they knew anything about the properties of opium.

It will thus be seen that capsules of the poppy aroused the attention of the human race long before opium was known. Little wonder then that after their narcotic and soothing properties were appreciated by those practising in the healing art, they became known to the laity, who made use of them for purposes of satisfying the almost universal desire which human beings possess for a stimulant or a sedative.

*Medical uses of poppy capsules.*—Poppy capsules have been used in both the Ayurvedic

or the Hindu medicine, and the Tibbi or the Mohammedan medicine for many centuries, as a sedative both for internal use and external application. The *hakims* prescribe them for headache, diarrhoea, dysentery and digestive troubles in children. They are used as a household remedy in many parts of India and are given during the teething periods by mothers to their children to keep them quiet. An infusion prepared from the poppy heads is used as a soothing application for bruises, inflamed, excoriated and swollen parts and sometimes as an application for various forms of painful conjunctivitis, inflammation of the ears, etc. Fomentations with poppy heads are even now applied to painful inflammatory swellings. In China the physicians used them freely in the early centuries of the Christian era. Most of the T'ang Dynasty medical writers and from them onwards, extol the merits of poppy capsules in the treatment of dysentery, especially when combined with astringent drugs.

*Use of poppy capsules for euphoric purposes.*—It is well known that the use of articles of stimulative, restorative or sedative character, is bound up with the natural history of human beings from the very earliest times. The use of such articles as cocoa, coffee, tea, opium, alcohol, etc., to procure an added feeling of pleasure, has been recorded long before the history of civilisation. All of them in moderate quantities, produce a favourable effect on the mental conditions of man. Whether they have a stimulating or a depressing effect on the central nervous system, they all produce an enhanced sense of well being or euphoria. The capsules of the poppy were used very early for this purpose. Whatever may have been the case in the countries of its origin (e.g., Asia Minor), there appears to be little doubt that poppy heads began to be used for euphoric purposes in India soon after the introduction of the poppy plant into the country. There the plant was known as *koknar*, the capsules were called *goza*, *khol-i-koknar* or *post-i-koknar* or simply *post* or *post doda*. In the time of the Moghuls a beverage made from the poppy capsules known as *kuknar* was very commonly used throughout the country. Abul-Fazl in his *Ain-i-Akbari* mentions about the Emperor himself taking this drink. He says "whenever His Majesty is inclined to drink wine, or take opium or *kuknar*, trays of fruit are set before him." The use of the word *kuknar* apart from opium in the above passage shows that both the poppy capsules and the inspissated juice or *Afyun* were used. According to Watt the beverage *post* at present taken in the Punjab, closely resembles *kuknar* which was a luxury among the Mohammedans in the time of Akbar. There is also mention of a beverage known as *Char-bughra* which was a mixture of wine, hemp, opium and poppy capsules. Many other references in the Moghul literature

\* Being a paper read at the Medical Section of the Asiatic Society of Bengal, on April 14th, 1930.

passes into a state of depression, the individual becoming drowsy, and he may fall off to sleep. The stage of depression is not nearly so marked as in the case of opium. The effects completely pass off in 5 to 8 hours. The excitement stage, we have already said, is more pronounced than with opium. The effect appears much more quickly, probably due to the fact that the alkaloids are taken in the form of solution and are absorbed more rapidly. When the habit has established itself for a long time the addict generally looks dull and sleepy, becomes slow of comprehension and inattentive. His gait becomes heavy, his movements slow; he is careless in dress and dirty in his habits. His speech is slow and hesitating, in monosyllables, jerky, and his voice is husky as if he is talking in his sleep. The only time when he brightens up and looks his normal self is when he has taken his potion, and for 2 or 3 hours afterwards. Even then his method of talking gives him away. He speaks as if in a dream; he pays little attention to what is said to him but goes on muttering to himself. Even small doses, e.g., 5 or 6 capsules a day, appear to produce a marked physical deterioration when continued for prolonged periods, and the addict becomes mentally degenerated and lazy. We found that even those addicts who took small doses could carry out their ordinary vocations only with difficulty.

The addicts say that poppy heads do not upset their digestion, in fact it is claimed that the appetite is sharpened and they can eat more and digest better. They claim that their eyes feel dry, the sight is improved, and cough and expectoration are decreased. It is said to dry all the excessive secretions. Some claim that it gives them relief from asthma. A drink of *post* in the evening after a hard day of toil refreshes them and gives them ease of mind and langour of the body.

Those addicted to this drug are generally believed to suffer from sluggishness of the bowels and chronic constipation. It is well known that morphine decreases general sensitiveness and, therefore, responsiveness to the defæcation act. The response to the distensive stimulus of peristalsis is decreased and there is quietening of peristaltic movements. Opium, therefore, gives rise to chronic constipation. The action of morphine esters, e.g., codeine, is less marked in this respect and that of narcotine and papaverine is even weaker. These latter alkaloids, however, have a direct, depressant action on the smooth muscle of the intestine and, therefore, tend to diminish peristalsis. The act of defæcation thus becomes difficult, so much so that the addicts sit for hours together and forget that they are in the act of defæcation.

The addicts are very forgetful not only of themselves but of their surroundings. They appear to lose all idea of correlation of

time and space; they forget their environment and do not know what they are engaged in doing. They may sit in one place for hours together doing nothing, without feeling it. They may walk a few yards and think that they have travelled for miles, or they may have walked for miles and think that they have walked only a few paces. They may go on doing hard work for hours without feeling it, or they may sit idle for long periods. They lose the idea of correlation of touch, perception and localisation and many stories are told about it. The addict to *post* becomes mechanical or automatic in his actions and appears to have no control over his will power.

*Physical, mental and moral effects.*—That addiction to poppy heads produces considerable physical, mental and moral degeneration, there is little doubt. Our impression from the study of our cases is that as compared with opium these effects are much more pronounced with much smaller quantities of the alkaloids which are contained in the poppy heads. The features we have described above are so typical of the addict that he can easily be recognised. While an opium addict taking small doses may not be easily differentiated from a normal individual, a person taking even small quantities of *post* at once gives himself away. So much so that in the Punjab a lazy, slovenly, dull and unintelligent looking person is often called a *posti* (or one who indulges in poppy capsules).

The addicts, who have taken the drug for some time, are as a rule spare and emaciated individuals with stunted growth and subnormal weight. They have a sallow, muddy appearance, sunken eyes and anæmic cheeks. Their eyes look dull and sleepy, they have heavy palpebræ and dry conjunctivæ. Advanced cases who have taken large doses look cachectic, have a dirty tongue, foul breath, and give the impression of suffering from chronic intestinal toxæmia. The subcutaneous fat is absent and the muscle tissue is wasted so much that the dry skin becomes quite loose over it. The throat is dry, respirations are slow and shallow and the expansion of the chest is impaired. The pulse at the wrist is weak, slow and compressible, soft hæmic murmurs are not unfrequently audible.

As regards the mental effects they differ somewhat from those of opium. The excitement stage is more prolonged on account of the smaller amount of morphine and larger quantities of the alkaloids of the iso-quinoline group, i.e., narcotine and papaverine. There is a feeling of elation, exuberance and well-being, which manifests itself in speech and gestures. In this stage the addicts become very communicative and reveal all their secret thoughts. There is loss of responsible control over mental processes, but the control of movements is not impaired as is the case with

alcohol. The net result of the action on the psychic areas is unrestrained imagination which may take different directions in different individuals. In some it will produce excitement, in others drowsiness and sleep. The irritation of the nerve cells produces hallucinations which, though present in this addiction, are not so prominent a feature as in the case of cocaine. The effect on the addict who has taken the drug for long periods resembles a chronic poisoning of the nervous system, especially of the higher psychical areas, which alters the mental activity from a state of high irritation to a complete breakdown even to paralysis. The addicts are generally feeble-minded individuals and are untruthful, selfish and self-centred.

*Abstinence symptoms.*—These closely resemble those of opium. The effect of one dose of *post* lasts for 4 to 8 hours and it is generally so arranged that by that time the next dose is taken. Usually about half an hour before the due time the addict begins to yawn, feels dull, heavy, depressed and very tired. His eyes begin to run, there is sneezing, salivation and frequent spitting. Some have flatulence, eructations, and even pain in the abdomen. If a dose is not then taken, the fatigue increases, headache comes on, vague pains set in all over the body, which may localise themselves in some of the joints and may become excruciating. If still the dose is withheld the restlessness increases, the addict becomes very irritable and peevish; he becomes morose and despondent of his life; he has a sinking sensation and there may be a feeling of impending death. In some individuals the respiratory symptoms are more marked, the addict suffering from dyspnoea, and paroxysms of severe cough. In others the gastro-intestinal symptoms are prominent, there being frequency of stools, diarrhoea and colicky pain. In yet another group the nervous symptoms are the chief manifestations, the addict complaining of dimness of vision, formication, a tingling sensation over the body, and insomnia. As a rule the addicts are so careful of their next dose that they do not give an opportunity for these symptoms to arise, by making sure of it when it is due.

We have in another paper referred to a marked decrease in the opium habit in India since the advent of British rule, on account of the restrictions imposed on the production, possession and sale of the drug. Addiction to poppy capsules is another example. This habit which was once universally present among all sections of the population during the time of the Moghuls has now practically disappeared from British India, with the exception of a small area in the Punjab. The habit here has been so deeply rooted that total prohibition of cultivation of poppy heads would have led to acute distress among the population. The production is, therefore, being slowly decreased and the number of addicts is going down

rapidly. It is hoped that before long it will be entirely stopped and this pernicious drug habit will be a thing of the past.

## SHORT TERM FEVERS IN THE PUNJAB.

By JAMAL-UD-DIN.

MAJOR, I.M.S.,

*Civil Surgeon, Attock District, Campbellpore.*

LATTERLY it has been one's privilege to spend the summer between three stations. Since a certain amount of resemblance is obvious between the types of fevers observed at each of these stations and the course run, the opportunity is here taken to record more typical cases from each of the stations with such explanatory notes as are considered necessary. The conclusions drawn at the end are ventured in the hope that they will receive the light of criticism by more capable workers.

The summer of 1929 in the Punjab generally was most unique in several ways. The heat was most oppressive until the outbreak of the monsoon, and record temperatures were recorded. The monsoon broke comparatively early and was characterised by little rain in the eastern districts of the Punjab, which are usually those most bountifully supplied and it spent itself on the south-western districts of the Punjab. Record floods in the western rivers of the Punjab occurred and of necessity there was a rise in the subsoil water level.

Cases 1 to 5 were observed at Ambala and relate to the period of summer before the onset of the rains. The surroundings were considered not at all favourable to the breeding of mosquitoes. On the other hand, with thatched roofing of the houses and matting, ideal surroundings for harbouring sand-flies were noticed. I may mention also that all these cases were taken from the same house.

Cases 6 and 7 were observed at Lahore at the time of the summer when the end of the monsoon had just set in. Even so, very few mosquitoes were noticed in the vicinity and those generally *Culicidæ*.

The last two cases in the list were observed at Campbellpore in the beginning of the winter. The place itself is well drained, and but few mosquitoes both of *culicine* and *anopheline* types were noticeable. Sand-flies are usually numerous but none were noticed in late November or early December when the cases occurred.

*Case 1.*—J., a boy aged 10 years, of delicate constitution. The fever was of sudden onset, with vague pains all over the body. At times he was flushed, at others the skin was cold with a fairly high temperature in the mouth. The throat was congested, but there were no other signs to be observed. The blood smear did not show malaria parasites. One dose of quinine, given on the fourth day, was held responsible for the rise of temperature to 103°F. on the following day, by his relatives. Convalescence was slow.

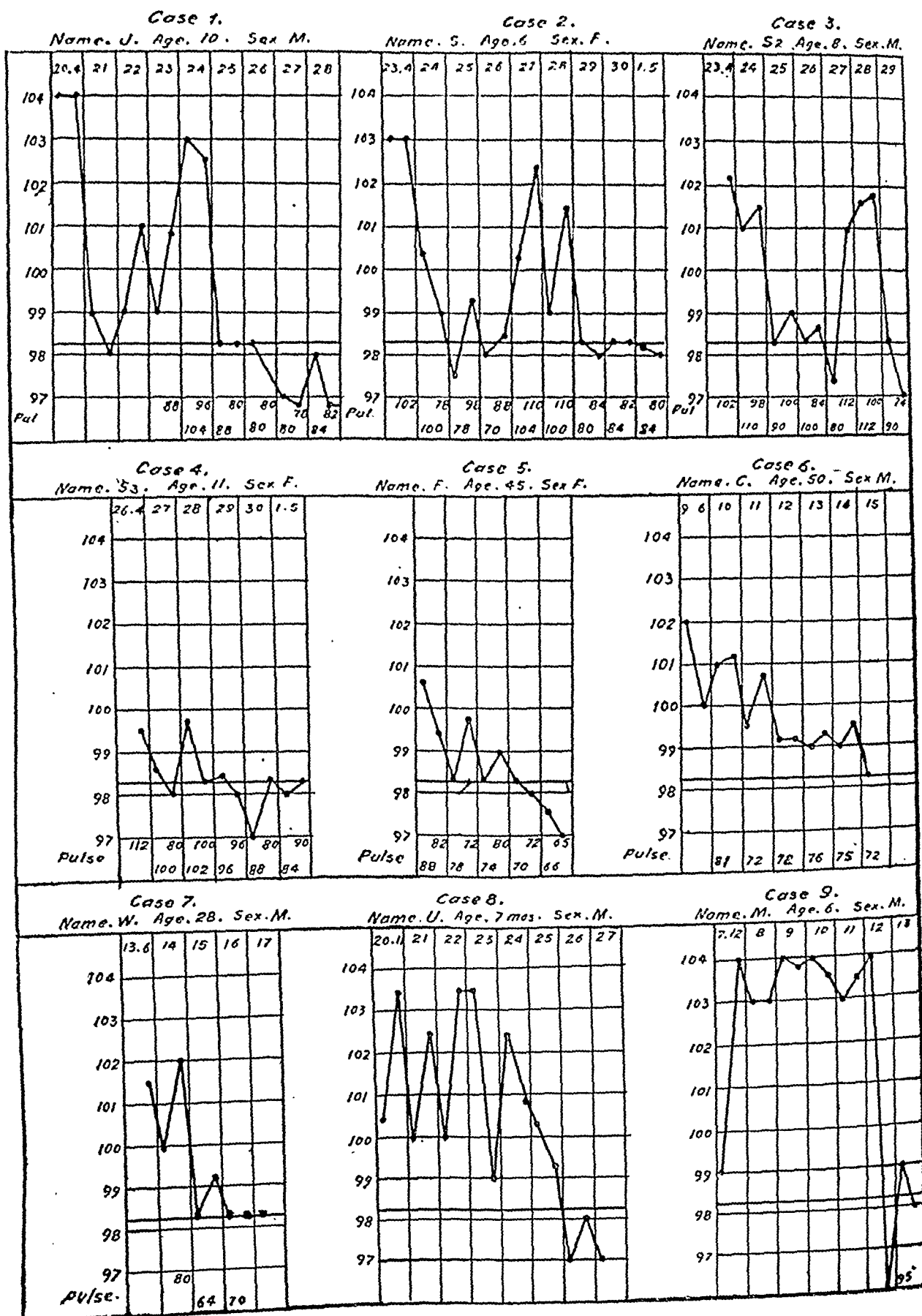
*Case 2.*—S(1), a girl aged 6 years. The onset was sudden, similar to, and three days after the onset in Case 1. She did not complain of any discomfort, but

had a slight distaste for food. No malaria parasites were detected in the blood film. The patient was cheerful throughout her illness.

Case 3.—S(2), a boy aged 8 years. The onset occurred two days after that of Case 2. The throat was

Case 4.—S(3), a girl aged 11 years, healthy and strong. She felt but little out of sorts and was not confined to bed.

Case 5.—F., maid-servant, aged 45 years. She complained of vague pains all over the body, most marked



congested and the tonsils enlarged; no other sign was noted. No malaria parasites could be detected in blood film.

in the lumbar region. No signs were observed, but the patient was very depressed all through the course of her illness.

*Case 6.*—Male, aged 60 years, subject to prickly heat. His only complaint was a strong objection to staying in bed. No malaria parasites were detected in the blood film.

*Case 7.*—Male, aged 28 years. He complained of slight frontal headache and loss of appetite. No malaria parasites were detected in the blood film. No leucopenia was noticed. In this case the differential leucocyte count was done and gave the following figures:—

Polymorphonuclears	..	..	61 per cent.
Lymphocytes	..	..	35 " "
Large mononuclears	..	..	4 " "
Eosinophiles	..	..	0 " "

*Case 8.*—U., a male child, aged 7 months. Had had an attack of diarrhoea a fortnight previously. The throat was congested and the tonsils very much enlarged. He was restless at times and respirations were impeded, but the chest was clear; other systems normal. The child was off his feed at times throughout the course of the illness. Convalescence was slow.

*Case 9.*—M., a boy, aged 6 years. Gave a previous history of fever which had been treated with quinine. The throat was very congested and the tonsils very much enlarged. The spleen was not enlarged; the other systems were normal. He complained of slight earache on the right side for the first two days of the disease, also of occasional pains round the right shoulder. He was constipated throughout the course of the illness and the abdomen was slightly tympanitic at times. Quinine was pushed during the first three days of illness, but then discontinued in favour of symptomatic treatment.

#### CONCLUSIONS.

1. A remarkable absence of any definite signs or symptoms would appear to characterise all the above cases, and the fact of their similar course is my reason for putting them into the same category.

2. The terms seven-day fever and sand-fly fever are interchangeable and denote the same clinical condition.

3. In elderly subjects, who are the most likely to have suffered from previous attacks of the disease, and in strong healthy subjects, the course of the fever is shorter, and more typical of three-day fever; on the other hand, children are more severely affected and in them the course of the fever usually lasts seven days.

4. Although similarities may be detected in the course of the fever, the condition is a distinct entity from dengue with its two rashes. Rashes were looked for in these patients, but were never seen.

5. Lung complications and signs being absent, the condition could not be confused with influenza.

6. The administration of quinine is not indicated, it may give rise to alarming symptoms, and should be avoided. The continued high temperature in the last case might be attributable to quinine, which was administered freely during the first three days of the disease.

## THE CARE OF THE ELECTROCARDIOGRAPH IN THE TROPICS.

By G. R. McROBERT, M.D., M.R.C.P.,

MAJOR, I.M.S.,

*Professor of Physiology, Rangoon University.*

THE use of the Einthoven string galvanometer—usually incorporated in a combined outfit of galvanometer, camera, time marker and light source, and known as the electrocardiograph—is becoming increasingly common for the diagnosis of heart disorders and for the control of their treatment.

In the great majority of cases the instrument used is the Cambridge Instrument Company Standard Type, which has given general satisfaction in Europe.

During the past four years I have had occasion to visit some of the leading laboratories and hospitals in India and the Eastern Tropics, and have found that in a number of cases the electrocardiograph was out of action and had been so for some time, despite attempts to rectify defects by following carefully the instructions set forth in detail in the official handbook of instructions issued along with the instrument by the makers.

As I myself have had to overcome difficulties in maintaining in order the two standard models used in Rangoon in the General Hospital and Medical College, respectively, I have written these notes, with the concurrence of the Cambridge Instrument Company, in the hope that they may help others who have to operate these instruments in hot and damp climates. They are to be regarded as supplementary to the tables of "faults, possible causes and remedies" given in the instruction booklet issued with the instrument.

In the first place, A. C. interference is very liable to occur during the rains and the greatest possible care must be taken to insulate the chair, electrode stands and leads from the floor and walls. In Rangoon we use dry india-rubber blocks for this purpose. On one very wet day A. C. interference was noted when a patient seated in an insulated chair allowed his damp puggaree to touch the wall behind his head.

My chief difficulty has been with the slide-wire compensator and with the material used to insulate the wire. It is, of course, well recognized even in Europe that the slide-wire may become dirty, with the result that either no electrical contact exists between the wire and the slide or that contact is present only in patches so that if the compensator control handle is rotated the fibre image flickers about. In Europe, however, the dirt can as a rule be removed with ease by friction caused by several rapid turns of the control handle, and only very rarely is it necessary to unscrew the whole control-case and to clean the wire with abrasive (rouge) paper.



In the tropics, however, one finds that if the instrument stands unused for more than two days or so, a non-conducting film forms on the slide-wire and that no proper contact can be obtained until the whole control box has been removed and the wire cleaned by means of abrasive paper. Further, the material used for insulating the wire is apt to become tacky and in cleaning the wire one has to be careful to avoid smearing it with the underlying sticky material. Although it is highly undesirable to allow persons unaccustomed to handling scientific apparatus access to the somewhat complicated interior of the control box, I should advise those, who think they can trust their subordinates not to meddle with the apparatus, to have the screws holding the control box in position (from behind) removed and to have this part of the apparatus made more accessible by fitting the left side of the box with hinges and the right side with fastening hooks. This gives ready access to the compensating mechanism. Frequent use of abrasive paper is, of course, harmful and can be obviated to a great extent by turning the compensator control handle once or twice throughout the whole length of its range at least once daily if the instrument is not otherwise used.

It may be found that the gilt glass fibre is too slack and that even when the adjusting wheel is turned so as to put as much tension on the fibre as possible, the deflection on the camera scale remains greater than the standard, i.e., one centimetre per millivolt of potential difference.

This fault is not included in the maker's rectification table as, with the careful testing and adjusting which each fibre undergoes before leaving the works, its occurrence in Europe is hardly possible. This defect in instruments working under tropical conditions is due to the difference between the co-efficients of expansion of the glass of the fibre and the metal of the holder. This is a point for which the makers cannot make accurate allowance before dispatching the fibre cases as they would have to adjust the fibres so tightly in Europe that they would be in grave danger of fracture during transit.

I have been able to rectify this defect by slackening the fibre as much as possible by means of the adjusting wheel, bending the supporting flags gently to increase the tension and then gradually tightening up by means of the wheel. This method, however, is a rough one and is not to be recommended. I am obliged to the Cambridge Instrument Company for pointing out that although this is, strictly speaking, a maker's adjustment and is not ordinarily carried out in Europe by users, the adjustment nut (letter M, fig. 17, standard book) may be cautiously turned in an anti-clockwise direction in order to permit the

tension adjustment screw to operate over a greater length, and so to take up the abnormal amount of slack.

As a very small amount of rotation of the nut makes a very material difference to the length of the fibre, a rotation of 5 to 6 degrees of an arc is all that is necessary to compensate for the effects of tropical heat. The makers ask me to appeal to persons making this unusual adjustment to proceed cautiously and to move the stop nut as little as possible.

Another defect which I have encountered more than once is "fibre intact and conducting but no deflection obtainable." In such cases microscopic examination of the fibre has shown that it was anchored to the walls of the fibre case by mould growths. I have succeeded in restoring the mobility and, consequently, the usefulness of such fibres by cautiously removing the brass protective plates, fixing the case in a vertical position and then allowing small drops of absolute alcohol to run from a fine pipette on to the upper flag and so down the fibre. I imagine that if the growth of mould were very extensive or old this procedure would result in rupturing or at least destroying the conductivity of the fibre but it is worth trying. In the rainy season spare fibres should be kept in dry air-tight cases.

The usual difficulties found with wooden drawers sent out from England will be encountered during the rains in connection with the recording camera for bromide paper. This may be overcome by having the removable drawer lightly planed and sandpapered and by having a projecting flange of black velvet fitted round the outside edge to prevent light entry in dry weather. It will be found, however, that at any rate for research purposes, when long continuous records are taken it is better to dispense with the drawer altogether and to use a black bag fitted to the lower compartment of the camera by means of a wooden frame for the reception of the exposed roll.

With attention to these points there is no reason why the standard Cambridge electrocardiograph should not render in the tropics the same useful service that it has in Europe. I should like to help to dispel the idea that there is something mysterious and magical about the electrocardiograph and that it is an unreliable and refractory instrument. It certainly requires a good deal of care and attention but not more than any careful worker is prepared to expend on his microscope.

The Cambridge Instrument Company has now put on the market a portable model of which I have no experience, but an examination of records obtained by it and the fact that it is of all metal construction lead one to think that for practical utility in the tropics it is superior to the standard instrument.

## A PLEA FOR MORE CONFIDENCE IN THE PERITONEUM.

By W. F. BRAYNE, B.A., M.B., Ch.B.,  
LIEUTENANT-COLONEL, I.M.S.,  
Civil Surgeon, Mandalay.

SEVENTEEN years ago I was called to see a man who had been disembowelled by a buffalo. A Sub-Assistant Surgeon had arrived before me, pushed back the dirty intestines which had been lying on the road, and sewed up the wound with an ordinary piece of packing twine and a needle used for sewing fruit baskets. I was very angry, and told the Sub-Assistant Surgeon that he should have waited for me, and that the man would die in a few days.

Three weeks later, the Sub-Assistant Surgeon showed me the man, with great pride, perfectly recovered. I thought the result was due to the extraordinary resistance of a jungle Burman.

Last year when operating on a European lady in the rains, the theatre was full of insects. Numbers of dung-beetles and other insects flew into the abdomen during the operation. I remember one large dung-beetle getting so tangled up in the omentum that it had to be cut out.

The patient recovered without any peritonitis. Thinking over these and other similar cases, I came to the conclusion that the peritoneum, instead of being the surgeon's worst enemy was really his best friend, and that if only it were given a chance it could overcome almost any infection. The records of deaths after ruptured duodenal or typhoid ulcers, stab wounds of the intestine, etc., in this hospital had up to this time shown a very high mortality.

It appeared to be probable that it was the insertion of drainage tubes which was preventing the peritoneum from overcoming infection, the drainage tube being a foreign body and also draining away the lymph which the peritoneum poured out in order to overcome the infection. I therefore started closing all septic abdomens, with the exception of those in which there was a definite abscess cavity limited by adhesions.

As the abscess cavity limited by adhesions is physiologically outside the abdomen, this meant really the closing of all septic abdomens without drainage.

Since I reached this decision, my assistant, Dr. Simson, and I have operated on the following cases and in all cases the abdomen has been closed and no tube or other drain left in. In all cases recovery has occurred.

(1) Burmese male, aged 26, perforated typhoid ulcer of the abdomen, full of infected fluid. The perforation was closed, all fluid sucked out of the abdomen and the abdomen

was then washed out with normal saline and closed. The patient's recovery was uninterrupted.

(2) Chinese male, aged 47, stab wound of the abdomen. The small intestine was cut through in three places close together. The peritoneal cavity was full of faeces. This injured piece of small intestine was resected and lateral anastomosis done. The abdomen was washed out with saline. The omentum which was very foul with faeces could not be cleaned. The abdomen was closed and the patient made an uneventful recovery.

(3) Indian male, aged 40, sloughing ruptured appendix. Uninterrupted recovery.

(4) Burmese female, aged 17, ruptured gastric ulcer. The ulcer had ruptured 55 hours before the operation. The ulcer was closed, the abdomen washed out with saline. Uninterrupted recovery.

(5) Hindu male, aged 30, ruptured duodenal ulcer of 12 hours' duration. Same procedure as 4. Recovery.

(6) English male, aged 50, sloughing ruptured appendix. An area of 2 inches by 1½ inches covered with sloughs and pus was left after the appendix had been removed. The intestine was very friable. The omentum was fastened over the septic area by a couple of stitches. This was a typical case in which the introduction of a tube would have resulted in a faecal fistula. The patient left with the wound soundly healed on the 21st day after operation.

(7) Burmese male, aged 45, a retrocaecal appendix, very high in position. The appendix was lying on the posterior abdominal wall and pus was leaking into the abdomen from its anterior aspect. Owing to this leakage there were adhesions between several coils of small intestine, and the small intestine was adherent to the anterior abdominal wall along the line of the incision. Behind the appendix was an abscess cavity about 1½ inches by 1 inch. After the removal of the appendix, half of the abscess cavity was left exposed and a septic groove some 3 inches long in which the appendix had been lying. This septic area was swabbed dry and the omentum fastened over it by 3 sutures.

The abdomen was then closed. The patient made an uninterrupted recovery.

While of course it is impossible to draw conclusions from such a short series of cases, the infection in some of these cases has been so gross and the recovery so quick that I feel that I should publish these results without waiting for any more cases in order to give others the opportunity of trying this method as early as possible.

Neostibosan given in ordinary doses (0.3 gramme) on alternate days or twice weekly will usually effect a cure in about 20 to 25 injections. By concentrating the course and giving larger individual doses, as we do when the patients are in hospital, a cure can usually be effected more rapidly. In one case a course of injections consisting of 12 daily injections, or a total of 5.7 grammes, was sufficient to produce a cure, but the disappearance of the nodules was delayed for more than a month after the treatment had been completed, and in another patient with most extensive lesions, two courses of 12 and 9 daily injections, totalling 5.7 and 4.3 grammes respectively, produced very marked immediate improvement. At the end of three months all signs of active disease had disappeared (see Figs. 1(a) and 1(b)). In view of the fact that this patient had suffered from extensive facial disfigurement for thirty years it seems probable that his face will not recover its normal contours for a considerable period, if it ever does so. The large raised plaques which were on this patient's arms and legs are now flat, though still depigmented.

One patient was given a course of 20 injections of Fouadin, a trivalent aromatic compound of antimony, on alternate days, a total of 95 c.cms. of 8 per cent. solution; his nodules

had almost disappeared at the time of his discharge.



Fig. 1b.

*An analysis of the results of treatment of 82 patients treated in the out-door department of the Calcutta School of Tropical Medicine and Hygiene.*

Of the 150 cases of this condition seen in this institution between October 1927 and March 1930, 28 attended for treatment in the kala-azar out-door department; these were all treated by Aminostiburea, a pentavalent compound of antimony, a combination of aminophenyl stibinic acid with urea and glucose, containing 24.8 per cent. metallic antimony. The injections were given intravenously twice weekly, 0.2 gramme being the maximum dose. The patients, who were nearly all adults, can be grouped as follows:—

Cured and discharged	..	..	23
Much improved (but discontinued treatment with permission, usually with the object of continuing it elsewhere)	..	..	16
Discontinued treatment	..	..	26
Still under treatment	..	..	17

TOTAL .. 82



Fig. 1a.  
Before treatment.

*Number of injections given.*

According to the number of injections received the patients can be grouped as follows:—

TABLE I.

Number of injections.	Total number of patients.	Number discontinuing treatment.	Number improved.	Number cured.	Percentage cured.
1 to 5 .. .. .	18	18	0	0	0
6 to 10 .. .. .	9	6	3	0	0
11 to 15 .. .. .	9	2	6	1	11.1
16 to 20 .. .. .	8	0	5	3	37.5
21 to 25 .. .. .	7	0	1	6	85.7
26 to 30 .. .. .	10	0	1	9	90.0
31 upwards .. .. .	4	0	0	4	100.0
Mean number of injections of each group.	..	4.73	15.5	26.70	..

*Total amount of compound administered.*

According to the total amount of drug given the patients can be grouped as follows:—

TABLE II.

Amount given.	Total number of patients.	Number discontinuing treatment.	Number improved.	Number cured.	Percentage cured.
1 gramme or less .. .. .	20	20	0	0	0
2 grammes or less but more than 1 gramme.	9	1	5	0	0
3 grammes or less but more than 2 grammes.	10	2	7	1	10
4 grammes or less but more than 3 grammes.	6	0	2	4	66.7
5 grammes or less but more than 4 grammes.	8	0	1	7	87.5
6 grammes or less but more than 5 grammes.	7	0	1	6	85.7
Over 6 grammes .. .. .	5	0	0	5	100.0
Mean total dose of drug in each group in grammes.	..	0.78	2.74	5.0	..

*Number of days under treatment.*

According to the number of days under treatment the patients can be grouped as follows:—

TABLE III.

Number of days.	Total number of patients.	Number discontinuing treatment.	Number improved.	Number cured.	Percentage cured.
1 to 30 .. .. .	20	19	1	0	0
31 to 60 .. .. .	15	6	6	3	20.0
61 to 90 .. .. .	9	1	5	3	33.3
91 to 120 .. .. .	11	0	3	8	72.7
121 upwards .. .. .	10	0	1	9	90.0
Average number of days under treatment of each group.	..	21.3	76.8	123.1	..

The cure rate with the different dosages and the different numbers of injections is shown graphically in Fig. 2. Reference to the tables

no treatment for kala-azar react more readily to the treatment for the dermal lesions. He still has the impression that this is the case,

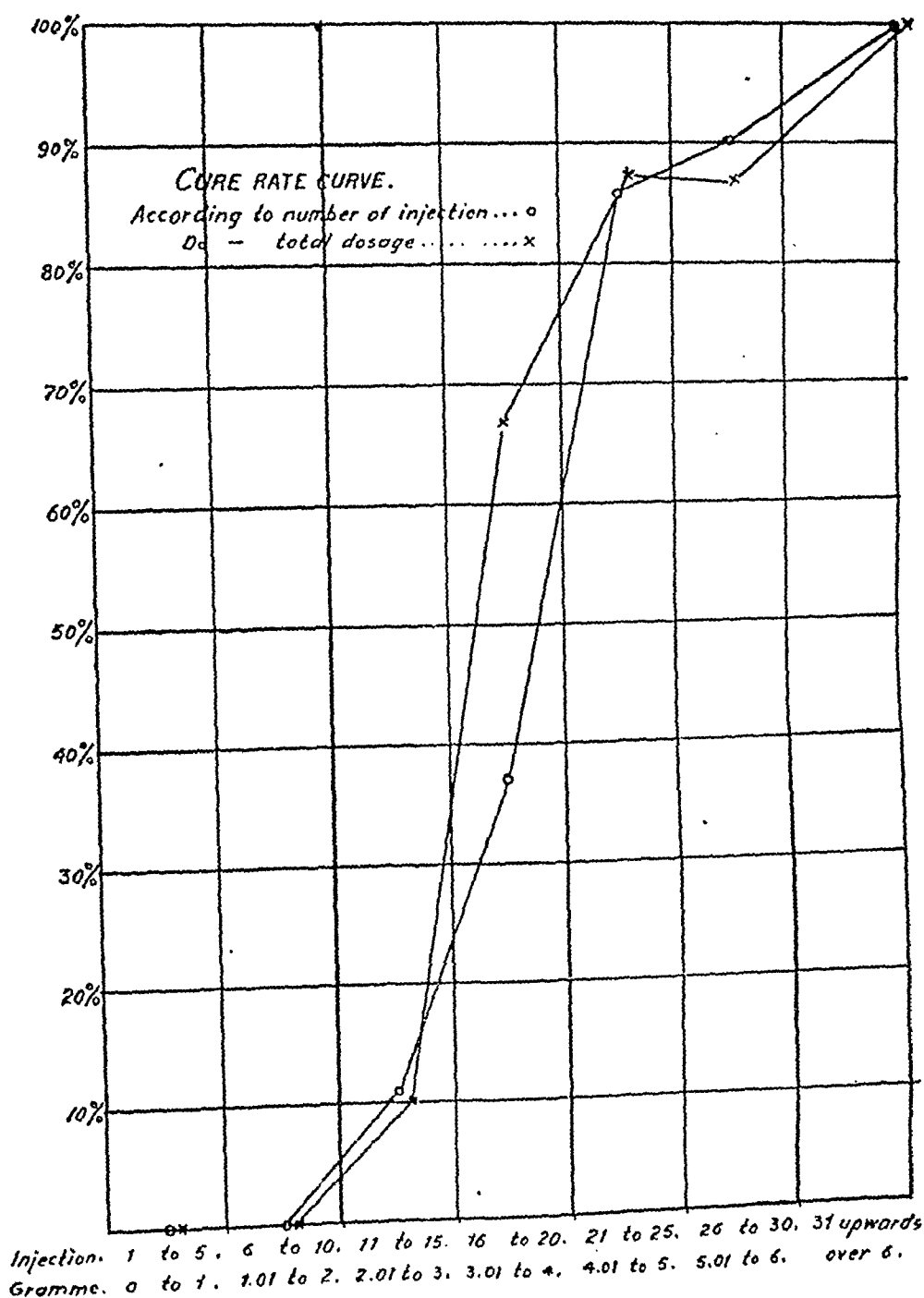


Fig. 2.

and the graph show that there is a very rapid rise in the cure rate curve between the 11 to 15 and the 21 to 25 dose marks, and between the 2 to 3 and the 4 to 5 gramme marks. There is also a corresponding rise in the cure rate in Table III (days under treatment); that one of the patients who had attended for more than 120 days was not cured can be accounted for by the fact that this patient attended very irregularly.

In his previous paper with Colonel Acton (Acton and Napier, 1927) Napier stated that those patients who have previously had

but there is nothing in the case records now being analysed to confirm this impression. The mean of the number of injections given in the cases of the cured group in which there had previously been no treatment for kala-azar is exactly the same as the mean of the total, namely 26.7 per cent.

In drawing conclusions from these observations we cannot be too dogmatic as it must be remembered that, although it has been assumed that the patients who discontinued treatment without permission were not cured, there is the possibility that their condition would progress

towards cure without any further antimony injections being given, as occurs frequently in the treatment of kala-azar.

In this paper we have not made any attempt to show that Aminostiburea is any more or any less efficacious in the treatment of dermal leishmaniasis than the other pentavalent compounds used in the treatment of kala-azar, nor is there any suggestion here that preference should be given to this preparation.

We may, however, state, from present and past experience with this and other pentavalent compounds, that most of the better-known pentavalent antimony preparations of antimony given in similar doses would produce very similar results.

#### Summary and conclusions.

The only satisfactory treatment for post-kala-azar dermal leishmaniasis is the intravenous injection of one of the pentavalent compounds of antimony which are efficacious in the treatment of kala-azar.

In the series reported Aminostiburea was the preparation used; the 23 patients, who were

R. Banerjee, H. N., and Banerjee, R. K. (1929). *Journal of the Indian Medical Association and Chemotherapy of Antimony*. *Indo-British Journal of Trop. Med. and Hyg.*, Vol. XXIII, No. 3, November, p. 301.

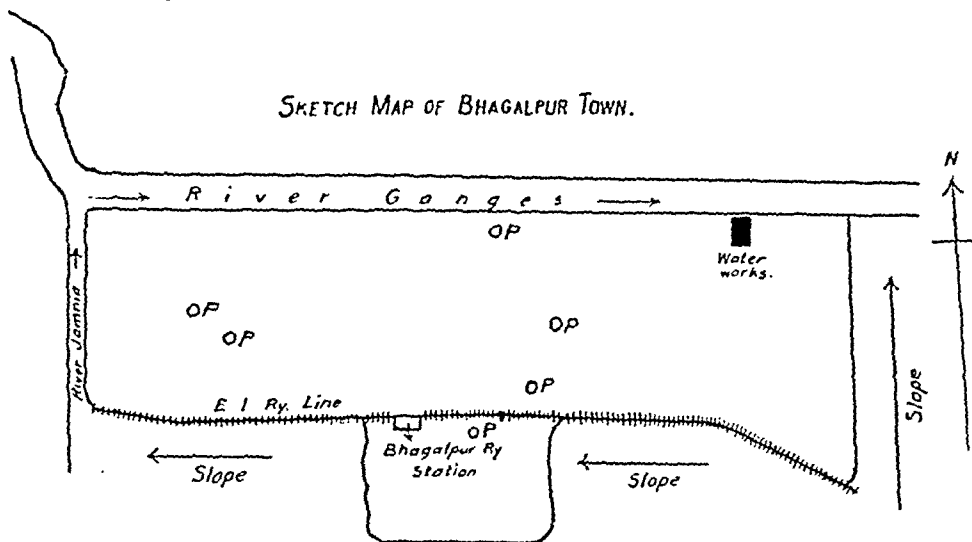
## STUDIES IN THE ANOPHELINE FAUNA AND MALARIA OF BHAGALPUR (BIHAR AND ORISSA).

By B. C. BASU, M.Sc.,

*Entomologist, Spirochaetosis Transmission Enquiry, Calcutta School of Tropical Medicine.*

IN October 1929, whilst on leave, I carried out a study of the anopheline fauna and malaria in Bhagalpur. The results of this investigation may be of some interest, as there is no previous detailed record of the anopheline fauna nor of the malaria of the place.

Bhagalpur, the chief town and administrative headquarters of the district and division of the same name, is in the province of Bihar and Orissa, and covers an area of 11 square miles. It is situated on the right bank of the Ganges, on a broad and well-raised belt of limestone, with a superficial layer of alluvium, in 25° 15' N. and 87° 0' E. (Fig. 1).



P. = Pond or tank

Fig. 1.

completely cured, received a mean total dose of 5 grammes, and a mean number of injections of 26.7, during a mean period of 123.1 days.

Patients should be warned that they will require at least 15 and possibly 25 to 30 injections, or at least 3 and possibly 5 to 6 grammes total dosage, to produce a cure, and that the period of treatment may extend up to 4 months. There are exceptional cases in which a much more extensive course will be necessary.

#### REFERENCES.

Acton, H. W., and Napier, L. E. (1927). Post-kala-azar Dermal Leishmaniasis. *Indian Journ. Med. Res.*, Vol. XV, 97, July.

The average temperature rises as high as 97°F. in April and falls as low as 50°F. in January. The average relative humidity has been recorded as being as high as 87 per cent. in July and August, and as low as 52 per cent. in March. The average annual rainfall is 46.63 inches, the maximum being reached in July.

The level of the town slopes irregularly towards the west and steeply towards the north, the lowest level being along the bank of the Ganges (with the exception of the water-works area here which is the highest point in the town); as a result the town is naturally and



rapidly drained into the Ganges, though stagnation of water in the *kutchas* drains along the sides of the roads in the middle of the town is not uncommon. These stagnant collections of water have been found to be the breeding places of anopheline mosquitoes.

The town has a filtered water supply from the Ganges. The water is raised by pumps, passed through settling tanks and filter beds, and distributed by gravity. There are four settling tanks and four filter beds, all of comparatively small size, as the supply of water is comparatively small. Anopheline larvæ were collected from both the settling tanks and the filter beds (Fig. 2).

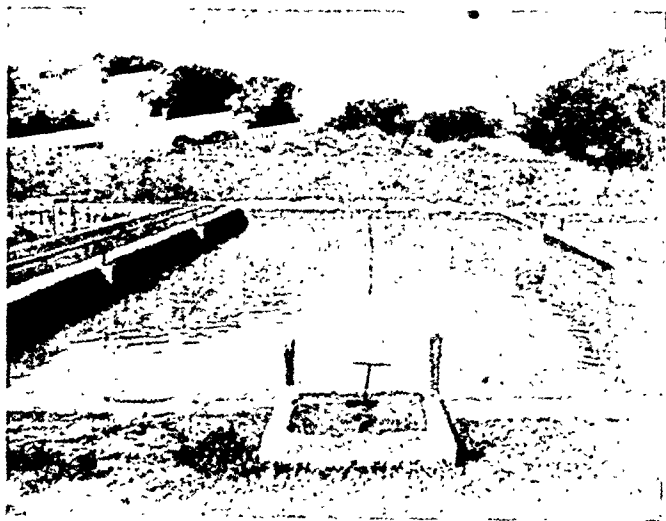


Fig. 2.

The daily average supply of filtered water provided is about 14.4 gallons per head at present, but it was as little as 7 gallons per head in 1904. Where there are house connections, the water is collected in reservoirs popularly termed *chaubachas*, and stored in them for use. Street hydrants fitted with self-closing taps are common in the town. These are much used as all houses are not provided with filtered water connections, but there is no arrangement for drainage of the unused water from the street taps, and consequently at the foot of every street hydrant there is stagnant water. Anopheline larvæ have been found breeding in these collections of stagnant water, as well as in the *chaubachas* previously mentioned.

Wells are very common in the area, but they are very deep, the water level being at a depth of 40 to 50 feet from the surface of the ground. They do not seem to breed anopheline larvæ, as examination of eleven wells gave negative results. Considering the large number of wells present in the town, however, and the small percentage examined, further investigation of these wells is necessary.

Tanks are few in number in the town; they are not kept in good condition, and are mostly full of submerged aquatic vegetation. In some of them, though all were used for dhoby

purposes, anopheline larvæ were found (Fig. 3).

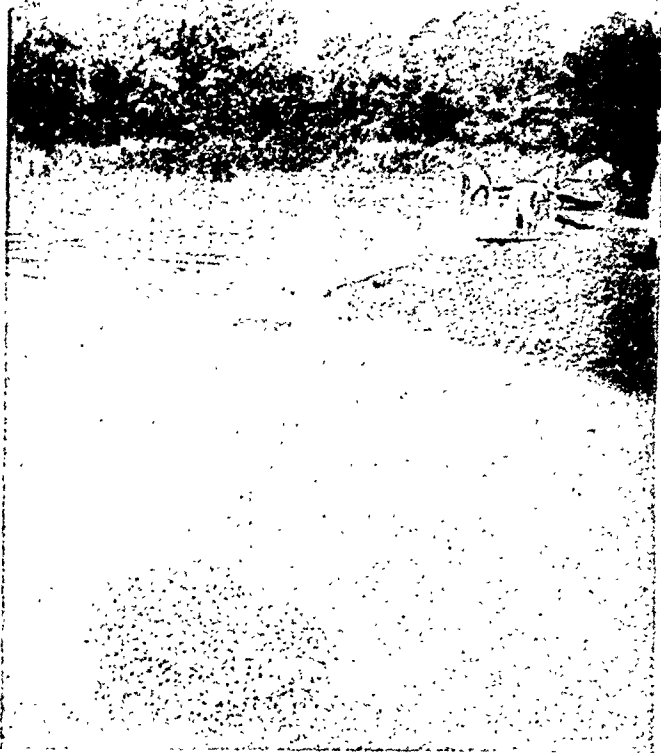


Fig. 3.

Borrow pits on the southern border of the town along the railway line were examined. They are old, being at the side of the oldest part of the East Indian Railway. Anopheline larvæ were found in these borrow pits (Fig. 4).



Fig. 4.

The anopheline species found were:—

*A. barbirostris* Wulp, found breeding in the tanks.

*A. culicifacies* Giles, found in the borrow pits beside the railway.

*A. fuliginosus* Giles, found in the tanks.

*A. hyrcanus* Pallus, found in the tanks.

*A. subpictus* Grassi, found in the tanks, in stagnant water in the *kutchas* drains, and in

the collections of stagnant water below the street hydrants.

*A. stephensi* Liston, found in the *chaubachas*, in houses, in the settling tanks and filter beds of the water-works, and in a small pucca drain lying parallel to the filter beds with both ends blocked with mud, and rain water collected in it. The larvæ in the settling tanks and filter beds seem to have but little chance of developing into adults, as the tanks and filter beds

are frequently dried in order to remove the silt from the settling tanks, and the uppermost (bacterial) layer of sand from the filter beds.

In addition to 1,029 larvæ of *A. stephensi* and 156 of *A. subpictus*, which were collected and preserved in fixative solution for examination, the following larvæ were allowed to breed out into adults:—

Species.	Total number of adults.	Males.	Females.	Percentage of total adults.
<i>A. barbirostris</i>	3	0	3	0.91
<i>A. culicifacies</i>	6	2	4	1.9
<i>A. fuliginosus</i>	8	0	8	2.5
<i>A. hyrcanus</i>	4	1	3	1.25
<i>A. subpictus</i>	64	32	32	20.06
<i>A. stephensi</i>	234	69	165	73.35
TOTALS	319	104	215	100

These figures indicate that *Anopheles stephensi* is probably responsible for the transmission of malaria in Bhagalpur; though such other carrier species as *A. culicifacies* and *A. fuliginosus* are present in the area, their numbers and suitable breeding sites are so restricted that they may be safely eliminated as not responsible for transmission in the town.

In the adult specimens of *A. stephensi* some were found paler in colour, and others darker; some were comparatively smaller and others comparatively larger. There is a distinct variation in the amount of speckling in the legs as well as in the palps in different specimens. In some specimens it was noted that the area between the middle and basal white bands in one palp were free from speckling, whereas the same area on the other palp showed speckling.

As regards the malariousness of Bhagalpur, the following figures are taken from the annual reports of the Civil Surgeon:—

Year.	Total number of in- and out-patients.	Number of cases of malaria treated.	Percentage of malaria cases to total cases.
1926	20,318	2,026	9.97
1927	24,072	2,026	8.41
1928	19,690	1,759	8.93

The monthly returns of the Civil Surgeon show that malaria is prevalent in Bhagalpur more or less throughout the year; the highest peak of the malaria curve is in August and the lowest in December (Fig. 5).

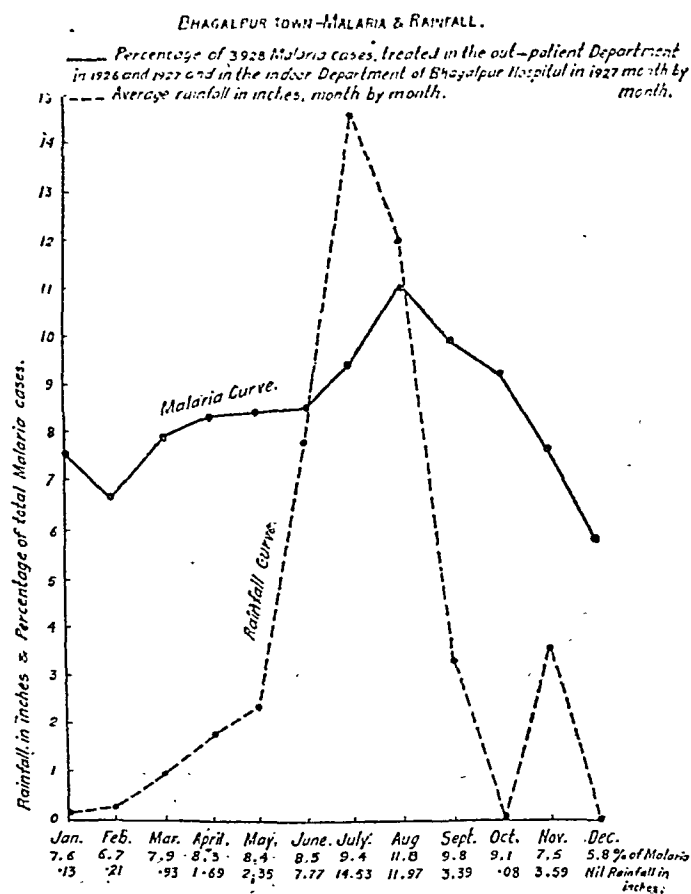


Fig. 5.

If the rainfall curve corresponds with that of the prevalence of *A. stephensi* in Bhagalpur, as it does in Calcutta, then the special incidence of malaria in August in the former town must be attributed to the maximum rainfall which occurs in July. This subject however requires further local investigation. The November rise in the rainfall might be held responsible for the malaria rise in January; the interval in this case being longer than that between July and August owing to the fact that the sporogony cycle of the malaria parasites is delayed at low temperatures.

According to Knowles and Senior-White (1927) hospital figures for malaria cases, though the diagnosis is chiefly based on clinical grounds, may be used for comparative purposes. The interesting paper by Murphy (1929) strengthens this view. He has shown that a certain percentage of clinically diagnosed malaria cases fail to show parasites, but also at the same time a fair percentage of cases diagnosed clinically as other than malaria show malaria parasites. These two factors tend to balance one another. Thin blood films were taken from 33 patients, clinically diagnosed as cases of malaria by one of the medical officers of Bhagalpur Hospital, and on examination gave the following results:—

Cases clinically diagnosed as malaria.	Number showing parasites.	Species.	Number.	Percentage of each species.	Number showing gametocytes.	Percentage of cases with gametocytes.
33	19	<i>P. vivax</i> ..	13	68.4	10	68.4
		<i>P. falciparum</i>	6	31.6	3	

It should be noted that the cases admitted to the hospital do not all come from Bhagalpur town itself, some come from rural areas, whilst there is a good deal of prejudice against coming to hospital for medical aid amongst dwellers in the town. On the other hand local medical practitioners of the assistant surgeons class, who were consulted, unanimously declared that malaria was one of the commonest diseases of Bhagalpur town.

Some twenty-six years ago Bhagalpur town was reported to be very healthy, with the exception of its low-lying western portion, which could not be said to be entirely healthy. It is difficult to explain the recent rise of malarial incidence in Bhagalpur town, though statistical evidence as well as the experience of the local residents points to successive famines, due to defective rainfall and floods in the district, being responsible for the present malariousness of the area. Under the pressure of scarcity of food in successive years the inhabitants of Bhagalpur migrated into the tea gardens of Assam, the Bengal Duars, and the mining areas, where the demand for labour is great, and employment was easily obtained.

Later, in the famine of 1908-09, which was due to deficient rainfall, people looked for places where crops were easily raised. By 1911 a large tract of jungle country and pasture land in the district of Purnea had been converted into fertile cultivable land by the westward movement of the Kosi river. The fertile land, good rainfall, and above all low taxation in the district of Purnea encouraged emigration from Bhagalpur—and indeed from the whole of Bihar—into Purnea. Purnea, however, has always been notorious for its malaria, and even some 48 years ago its extreme unhealthiness was noted in the *Statistical Account of Bengal*. There is a long-standing proverb concerning the unhealthiness of Purnea among the Indian community—"Na zahar khāo, na mahar khāo. Marna hai to Purnea jāo" (Don't take poison; if you have to die, go to Purnea).

The immigrants to Purnea did not settle there. They would till their lands, collect the crops, and then return to Bhagalpur, having also contracted malaria. It appears certain that a large number of malaria carriers were thus imported into Bhagalpur from Purnea, the tea districts, and the mining areas.

In population Bhagalpur is the second city in the province of Bihar and Orissa. From 1872 to 1901 the growth of the population

(Fig. 6) was due mainly to a great development in the export trade in agricultural produce and piece goods, and above all to the general healthiness of the place. There was a slight fall up to 1911; thereafter there was a rapid fall to 1921, due to famine, emigration, a heavy death roll in the influenza epidemic of 1918, a low birth rate in 1919, and amongst other factors to the increasing malariousness of the town.

Now *Anopheles stephensi* is a notorious carrier of malaria. Under experimental conditions Stephens and Christophers (1902) have recorded an infection rate of 100 per cent.; Liston (1908) one of 25 per cent., and Bentley (1911) one of 11 per cent. in Nature. Hence, considering the decaying condition of the population, the prevalence of a large number of malaria cases, the high percentage of gametocyte carriers, and the enormous numbers of *A. stephensi*, it is desirable that a thorough investigation of the anopheline fauna and malaria in Bhagalpur should be carried out, after which suitable anti-malarial measures may be instituted at once. The present investigation was carried out in the short period of eight days during a

vacation holiday, and therefore could not be a thorough one. If present conditions are allowed to continue, Bhagalpur is likely soon to

#### BHAGALPUR TOWN POPULATION.

—Population of Bhagalpur in six census years.

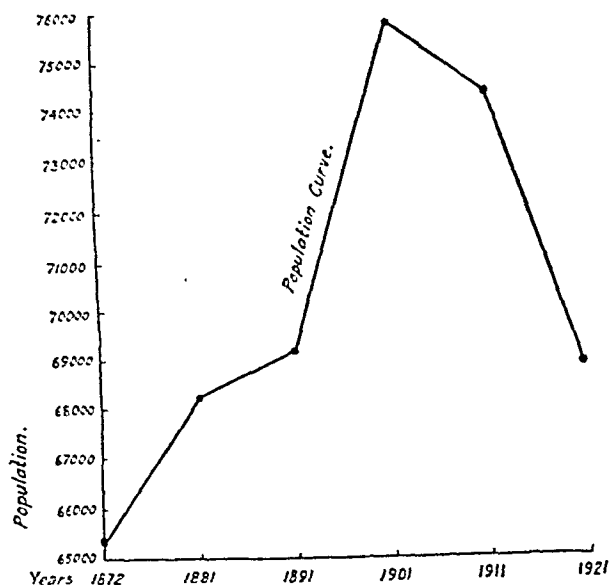


Fig. 6.

suffer from epidemic malaria, just as does its neighbouring subdivision of Supaul, which suffered from a severe epidemic of malaria in 1929.

The writer's thanks are due to Lieut.-Col. R. Knowles, I.M.S., Calcutta School of Tropical Medicine, without whose help this work could not have been carried out; also he would like especially to thank Dr. C. C. Guha, M.B., Assistant Surgeon, Bhagalpur Hospital, for his kind help with hospital records and patients.

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#### THE PARASITOLOGY OF MALARIA IN THE DARJEELING TERRAI.

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and

K. L. CHOWDHURY, M.B.

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DURING 1929 a survey party from this institution was deputed to collect data relating to the incidence of blackwater fever and malaria in the tea gardens of the Darjeeling Terai, and the following notes are a report on the malarial parasites of the region.

Thin films only were prepared from children aged from 2 to 10, and after staining with Leishman's stain, an examination of 6 minutes was given to each before pronouncing it negative.

The "parasitised children" rate was found to be 47.4 per cent. in 1,753 children, who included 307, or 17.5 per cent., of multiple infections.

The species indices worked out as follows:—

Benign tertian	..	..	40.3
Malignant tertian	..	..	48.6
Quartan	..	..	11.1

There were a few gardens physiographically distinct from the majority in the Terai and they were situated wholly or in part on the Himalayan foot-hills. The "parasitised children" indices and the species indices in respect of the foot-hills' gardens and the Terai gardens were as follows:—

		Foot-hills' gardens.	Terai gardens.
Parasite index	..	10.8	53.5
Proportion of each species in the para- site index—			
<i>P. vivax</i>	..	27.1 per cent.	40.3 per cent.
<i>P. malariae</i>	..	8.8	11.2
<i>P. falciparum</i>	..	64.1 "	48.5 "

The indices were also worked out for the tracts along the courses of some streams as follows:—

#### The Balasan.

Tea garden.	Parasite index.
Panighata .. ..	50.0
Ord .. ..	38.6
Matigara .. ..	32.06
Average parasite index	.. 40.22

	SPECIES INDICES.		
<i>P. vivax</i> .	<i>P. malariae</i> .	<i>P. falciparum</i> .	
16.6	0.0	83.3	
65.1	15.1	19.7	
77.4	9.6	12.9	

#### Average species indices—

<i>P. vivax</i>	..	58.03
<i>P. malariae</i>	..	8.2
<i>P. falciparum</i>	..	38.6

*The Chenga.*

				SPECIES INDICES.			
Tea garden.				Parasite index.	<i>P. vivax.</i>	<i>P. malariae.</i>	<i>P. falciparum.</i>
Belgachia	..	..	..	61.4	36.2	12.06	51.7
Merryview	..	..	..	50.0	63.8	11.8	24.2
Deomani	..	..	..	46.03	28.7	35.6	36.6
Atal	..	..	..	55.5	48.0	18.0	34.0
Goomgooma	..	..	..	62.0	44.06	13.4	42.5
Motidhar	..	..	..	52.9	44.4	0.0	55.5
Doom Dooma	..	..	..	59.9	44.8	17.9	37.2
Average parasite index				.. 55.82	Average species indices—		
					<i>P. vivax</i>	..	.. 44.28
					<i>P. malariae</i>	..	.. 15.53
					<i>P. falciparum</i>	..	.. 40.1

*The Dumania.*

				SPECIES INDICES.		
Tea garden.		Parasite index.		<i>P. vivax.</i>	<i>P. malariae.</i>	<i>P. falciparum.</i>
Fulbari	.. ..	..	12.1	46.8	9.3	43.7
Thanjhora	.. ..	..	55.5	35.3	9.3	55.3
Azamabad	.. ..	..	50.0	36.6	16.6	46.6
Nuxalbari	.. ..	..	46.3	43.3	9.3	47.3
Satbhaia	.. ..	..	61.5	27.5	0.0	72.5
Bijoynagar	.. ..	..	47.2	17.6	11.7	70.6
Kharibari	.. ..	..	55.5	60.0	0.0	40.0
Average parasite index			51.6	Average species indices—		
				<i>P. vivax</i>	..	38.2
				<i>P. malariae</i>	..	8.03
				<i>P. falciparum</i>	..	53.7

*The Taipoo.*

				SPECIES INDICES.			
Tea garden.				Parasite index.	<i>P. vivax.</i>	<i>P. malariae.</i>	<i>P. falciparum.</i>
Singhijhora	..	..	..	57.9	31.8	9.1	59.09
Hindu	..	..	..	70.0	48.7	13.07	38.2
Taipoo	..	..	..	54.05	23.3	6.6	70.1
Gungaram	..	..	..	70.7	32.7	8.6	58.7
Average parasite index				.. 63.16	Average species indices—		
					<i>P. vivax</i>	..	.. 34.1
					<i>P. malariae</i>	..	.. 9.34
					<i>P. falciparum</i>	..	.. 56.52

The indices in all the estates is given in the accompanying table below.

No correlation between the data will be attempted here, but it may be noted in general that the variation in the different indices in small communities like the lines of the tea

estates is submerged in the figures for larger localities.

We take this opportunity of thanking Dr. Strickland, Professor of Medical Entomology, for his help in the compilation of this paper.

*Parasite index and species indices of Terai gardens.*

Tea garden.	Parasite index.	SPECIES INDICES.		
		<i>P. vivax.</i>	<i>P. malariae.</i>	<i>P. falciparum.</i>
Gungaram .. ..	70.7	32.7	8.6	58.7
Moonee .. ..	52.0	30.7	11.5	57.8
Hansqua .. ..	41.1	51.7	26.1	19.2
Bagdogra .. ..	58.8	23.3	33.3	43.3
Singhijhora .. ..	57.9	31.8	9.09	59.11
Taipoo .. ..	51.5	21.65	6.65	71.65
Ord .. ..	38.6	65.1	15.1	19.8
Belgachia .. ..	61.1	36.2	12.1	51.7
Jhabra .. ..	67.8	12.2	9.6	78.2
Niphania .. ..	60.9	56.6	6.6	36.8
Kamalpur .. ..	59.01	45.3	5.08	49.62
Tirrihana .. ..	66.07	35.5	28.8	35.7
Atal .. ..	55.5	48.3	18.3	33.33
Deomani .. ..	46.03	28.7	35.6	35.6
Hindu .. ..	70.0	18.7	13.07	38.23
Goongooma .. ..	62.0	41.06	13.1	42.51
Doom Dooma .. ..	59.09	41.8	17.9	37.3
Sathhaia .. ..	61.5	27.5	0.0	72.5
Manjha .. ..	66.6	33.3	16.6	50.0
New Champta .. ..	59.5	41.07	5.3	53.63
Simulbaree .. ..	70.9	5.1	5.1	89.8
Putnibaree .. ..	52.3	13.6	13.6	72.8
Mohorgong .. ..	60.0	0.0	0.0	100.0
Sukna .. ..	52.1	36.08	40.2	23.72
Gulma .. ..	39.06	86.0	0.0	14.0
Nuxalbari .. ..	46.3	43.32	9.32	47.32
Azamabad .. ..	50.0	36.6	16.6	46.6
Ashapur .. ..	35.3	50.0	0.0	50.0
Thanjhora .. ..	55.5	35.3	9.3	55.3
Fulbari .. ..	42.6	46.8	9.3	43.9
Kharibari .. ..	55.5	60.0	0.0	40.0
Sahabad .. ..	47.6	26.1	17.7	56.2
Motidhar .. ..	52.9	41.1	0.0	55.6
Kamala .. ..	63.3	27.8	4.2	67.8
Merryview .. ..	50.0	63.8	11.9	24.3
Matigara .. ..	31.9	77.1	9.7	12.9
Chandmoni .. ..	46.8	81.8	2.3	15.9
Bijoynagar .. ..	47.7	11.1	18.3	70.6

*Parasite index and species indices of Foot-hills gardens.*

Tea garden.	Parasite index.	SPECIES INDICES.		
		<i>P. vivax.</i>	<i>P. malariae.</i>	<i>P. falciparum.</i>
Longview .. ..	3.6	33.3	33.3	33.3
Rhoni .. ..	5.3	50.0	0.0	50.0
Panighata .. ..	50.0	16.6	0.0	83.4
Lohagar .. ..	7.4	38.8	22.4	38.8

# THE BACTERIOLOGICAL FINDINGS IN THE CHLORINATED WATER SUPPLY OF A LARGE CITY IN THE TROPICS.

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FROM the title of this paper a piece of work such as this appears to be unnecessary and one might almost say absurd, since it is a recognised fact that a water supply which has been efficiently chlorinated is *ipso facto* above suspicion. The writer quite agrees with the above opinion but the points which strike one and which require elucidation are:—

(1) For how long is this same water going to remain above suspicion?

(2) Is this water, when it reaches the consumer after having travelled through miles of piping, of the same quality as it was immediately after chlorination?

(3) If not, to what extent has the quality of the water deteriorated and what is the nature of the organisms present?

Assuming that the water has been efficiently and sufficiently chlorinated, and that the main and distributing pipe lines are intact and free from outside contamination, one would expect to find even at the distal end a water showing a high standard of bacteriological purity. In the event, however, of organisms of a suspicious nature being found, one naturally begins to think of ways and means as to how, when



and where these organisms are gaining access to the water.

Rangoon, which depends upon lake storage and chlorination for the purification of its water supply, lends itself admirably to a piece of work of this nature and it is necessary to describe briefly its water supply system.

Rangoon obtains its water supply from Hlawga Lake about 17 miles distant from Rangoon. The original theory was that the water would flow into Rangoon by gravitation, but as this theory proved to be erroneous a pumping station had to be built at Yegu on the Kokine Road. This station possesses three Worthington Simpson steam pumps capable of discharging 12-13 millions of gallons of water in a day.

The water runs by gravitation from Hlawga to the Yegu Pumping Station. On the distribution side Rangoon possesses two reservoirs, the Pagoda Hill Reservoir of a million gallons, and the service reservoir at Kokine with a capacity of 20 million gallons. The latter is used as a reserve.

From Pagoda Hill the water flows by gravity through the distribution pipes until it reaches the public stand pipes and domestic taps. In addition to the Hlawga Lake supply, Rangoon is dependent to a certain extent on tube wells for its water supply. Such then is in outline the existing system of the Rangoon water supply.

A chlorinating plant was installed some years ago at the Yegu Pumping Station, and, judging from the results of weekly examinations of the water carried out at this Institute before and after chlorination, this plant is working very satisfactorily.

The results of examination of the water after chlorination, irrespective of the amount of pollution before chlorination consistently read: lactose fermenters absent in 100 c.c. with a negligible total count.

This water is therefore of a very high standard of bacteriological purity. It is necessary to mention however that the chlorinated samples of water are collected immediately after treatment, and before the water commences its journey through miles of piping, and this being the case the results obtained are just what one would expect to find.

I understand the chlorinating plant has been transferred to Hlawga, so that the water from Hlawga Lake is now being chlorinated at Hlawga.

Samples of water from the following circles were collected for examination, and in every case these were collected from a public stand pipe, the examinations being carried out at intervals ranging between 7 to 20 days.

1. Ma U Gon Road, Tamwe.
2. Thamadi Street, Tamwe.
3. Theinbyu.
4. Yegyaw.

5. 62nd Street, Botataung.
6. Little Sisters' Road.
7. Shwedagon Pagoda.

The selection of 4 of these circles from among the 18 circles into which Rangoon is divided, was made chiefly because they showed the highest mortality from diarrhoea and dysentery during the first 7 months—January to July, of the year 1929. It was thought that if the water supply, which may play an important part in the spread of these diseases, was in any way responsible for the mortality, the bacteriological findings in these four circles would furnish more important information as regards the effect of chlorination, than in those showing a low death rate from diarrhoea and dysentery.

These observations were commenced on the 1st September and up to the present 60 samples of water have been examined, the following determinations being made.

(a) The presence or absence of lactose fermenting organisms.

(b) Their capability when present in 10 c.c. or less of utilising citrate or otherwise.

(c) Their identification when non-citrate utilisers.

An analysis of these results according to areas, in so far as the presence or absence of lactose fermenters is concerned, and their ability when present in 10 c.c. of water or less to utilise citrate or otherwise, and in the latter case their identification, is shown in the table attached.

From this table it will be seen that out of 60 samples examined, 23 samples showed the presence of lactose fermenters in 10 c.c. or less. Further examination of these 23 samples showed 13 samples containing organisms capable of utilising citrate and 10 samples containing organisms incapable of utilising citrate, and therefore of presumably faecal origin which later were identified as follows:—

1. *B. coli communis*.
2. *B. neapolitanus*.
3. *B. acid lactici* (Hueppe).
4. *B. vesiculosus*.
5. *B. 67*.
6. *B. pyocyaneus*.

The above-mentioned organisms are all recognised as being faecal in origin and their presence in water shows undeniable evidence of pollution. Further, when found in small quantities of water in association with a heavy total count (six of these samples showed innumerable colonies in 1 c.c. on agar) the pollution may be regarded as heavy, and the water consequently should be looked upon with suspicion.

Two points of interest in the results are:—

(a) The water collected from Theinbyu, which shows the heaviest mortality from diarrhoea and dysentery, shows along with that from Ma U Gon Road the presence of lactose fermenting organisms in 10 c.c. or less in 5

TABLE.

Samples collected from	Total number of examinations.	SAMPLES SHOWING LACTOSE FERMENTING ORGANISMS PRESENT IN			Samples showing presence of citrate utilisers.	Samples showing absence of citrate utilisers.	Identification of lactose fermenting and non-citrate utilising organism.
		100 c.c. lactose broth.	10 c.c. lactose broth.	1 c.c. lactose broth.			
1. Ma U Gon Road, Tamwe.	10	5	3	2	3	2	a. <i>B. neapolitanus</i> . b. <i>B. coli communis</i> . c. <i>B. vesiculosis</i> .
2. Thamadi Street, Tamwe.	8	4	1	3	4	..	
3. Theinbyu ..	10	5	2	3	2	3	a. <i>B. neapolitanus</i> . b. <i>B. pyocyaneus</i> .
4. Yegyaw ..	9	6	2	1	2	1	a. <i>B. acid lactici</i> Hueppe. b. <i>B. neapolitanus</i> . c. <i>B. pyocyaneus</i> . d. <i>B. 67</i> .
5. 62nd Street, Botataung.	5	4	1	..	..	1	<i>B. neapolitanus</i> .
6. Little Sisters' Road.	9	100 c.c. + 3 100 c.c. - 3	2	1	2	1	a. <i>B. neapolitanus</i> . b. <i>B. vesiculosis</i> .
7. Shwedagon Pagoda.	9	7	1	1	..	2	a. <i>B. neapolitanus</i> . b. <i>B. pyocyaneus</i> .

samples, and 3 of these 5 as compared with two from Ma U Gon Road contain organisms of faecal origin.

(b) Three samples collected from Little Sisters' Road showed a reading of lactose fermenters absent in 100 c.c.

A few tests to determine the amount of free chlorine in samples of water collected from the areas already mentioned were carried out, with the following results:—

1. Ma U Gon Road, Tamwe	Trace	Trace	..
2. Thamadi Street, Tamwe	Trace	Trace	Trace
3. Theinbyu ..	0.1 ppm.	Nil	..
4. Yegyaw ..	Trace	Trace	..
5. 62nd Street ..	Trace	....	..
6. Little Sisters' Road	0.1 ppm.	0.2 ppm.	..
7. Shwedagon Pagoda	Trace	0.1 ppm.	0.2 ppm.

#### Conclusions.

1. The results of these examinations go to show that on occasions, in spite of chlorination, a city water supply shows evidence of undesirable pollution when it reaches the consumer.

2. As already stated, the identification of organisms of the lactose fermenting group was only carried out when they were found in 10 c.c. and 1 c.c. of water, and very probably had the identification of the lactose fermenting organisms found in 100 c.c. of water been made, an equal number of samples if not more would have shown the presence of non-citrate utilisers.

3. The result of examination of a sample of water collected shortly after being treated with chlorine and before it passes through storage reservoirs and piping covering large distances is not a reliable guide as to its quality

when it reaches the domestic tap or public stand pipe.

4. If the pollution emanates from and is carried down from the source of supply which in this case is an open lake it follows that the chlorination of the water is insufficient.

5. If, on the other hand, the pollution enters the water during the process of distribution through leaks in the system of pipes the fault lies not with the chlorination but with the distributing pipes.

6. It is hoped to carry out further work to ascertain definitely the source of the pollution, whether from the lake or from the distributing system and the adequacy of the dose of chlorine.

#### "BERIBERI" IN CHEDUBA ISLAND, ARAKAN, BURMA.

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IN the rainy season of 1929, beriberi appeared in epidemic form in Cheduba, a large island which forms a township in the Kyaukpyu district of the Arakan division of Burma.

The island, which, according to the 1921 census, had a population of 32,521, almost entirely Arakan Buddhists, lies to the south-west of Kyaukpyu Island, on the eastern boundary of the Bay of Bengal, in latitude 18°50' N. The inhabitants are very backward; the island contains no proper roads, and internal communications are of the most primitive description, communication between the sea coast and the interior being very difficult

they are being advised to collect the meal remaining from the hand pounding, and to consume it in the form of a porridge, or baked in cakes or biscuits. They are being advised to lay in a supply of dried peas, beans, and pulses, during the dry weather, and to keep them stored for consumption during the rains, especially in the germinated condition. They are further being advised not to throw away the water in which their rice is boiled, but to use this as a drink, or as a nucleus for their soups and curries.

In view of the apparent value of fresh toddy as a source of vitamin B, the question of the collection and storage of the excess yeast, which forms on the toddy and is at present discarded, is being examined, in the hope that it may be made use of as a protective food during the endemic season.

#### SUMMARY AND CONCLUSIONS.

What was at first supposed to be a new outbreak of epidemic beriberi in a remote island off the Arakan coast, has turned out to be an unusual incidence of this disease, which has long been endemic on the island.

During the rainy season of 1929 approximately 1,650 cases with 188 deaths occurred among a population of 32,500. The coastal villages suffered most, those in the interior being comparatively free.

The disease is definitely seasonal, its incidence during the rains, July and August being the months in which most cases develop.

While the occurrence of mouldy rice cannot be entirely excluded, there is very definite evidence of diet deficiency, particularly marked in the months of June, July and August. At this season white rice with a meagre and insufficient quantity of salted fish, a few green leaves and bamboo shoots, form the diet in the coastal village.

The villagers in the interior grow most of the vegetables and fruit, including beans, peas, pulses and ground-nuts, and have a sufficiency of these throughout the year.

The villagers make no use of the rice cleanings except to feed cattle and chickens. They further discard the water in which their rice is boiled.

Preventive measures to be tried include the use of red rice instead of white, the consumption by the people of rice cleanings, where rice is hand pounded, the storage of legumes in the hot weather for consumption during the months of June, July and August in the germinated form, and possibly the utilisation of toddy yeast as a food.

My thanks are due to Drs. U. Ba Shin and Kaung Mra Thoo, Sub-Assistant Surgeons of the Public Health Department, and to Dr. U. Ba Kin, Hygiene Publicity Officer, all of whose notes have been of value to me in writing this article.

#### STUDIES ON THE HYDROGEN ION CONCENTRATION OF SALIVA.

By S. N. MATHUR, M.B., B.S.,

*Lecturer in Physiology.*

*(From the Physiological Laboratory, Lucknow.)*

WHILE doing experiments on the relative digestibility of parched and boiled rice(1) I found that saliva was not constant in its reaction. The reactions noted were so marked that an independent study of its hydrogen ion concentration was thought fruitful.

Though in the textbooks saliva is generally stated to be alkaline in reaction, there are observations to the contrary. Rich(2) for example found it more often acid than alkaline, and McClelland(3) found its reaction altered by mastication. My observations show in addition, that it exhibits regular changes of reaction.

#### *Method of experiment.*

The subject at one signal began to accumulate saliva in the mouth and then at another, always at an equal interval from the first, ejected the saliva into a porcelain basin in which there was a drop of B.D.H. Universal Indicator. The reaction of the fluid was, thus, through the resulting colour, almost automatically indicated at the moment of ejection. The pH values given in this paper are determined from such colour changes.

It may be objected that this method gives only a rough approximation to the actual pH values. This is admitted, but at the same time it is pointed out that the variations in reaction of saliva are regular and so wide that they can be followed by even such an insensitive indicator as that used.

I find from the results that it is necessary to divide saliva into two kinds, *resting* and *active* respectively. Resting saliva may be defined as saliva taken from a person whose digestive organs are at rest (and in whom there is no large mechanical disturbance such as defaecation). It is in fact fasting saliva with the reservation that the fast does not merge into hunger (and that the digestive canal is undergoing no gross mechanical disturbance). Active saliva on the other hand, requires subdivision into two kinds, *chemical* and *mechanical*. The reason for the distinction will be seen later, as the results are described.

I shall take first the fasting condition into consideration. The precautions that I observed in collecting saliva for this were:—

1. The stomach was kept empty—nothing having been taken for eight hours previously.
2. The bowels had been emptied.
3. There were no hunger pangs.
4. During collection the muscles of the face and particularly of mastication were kept at rest.

With these precautions I found that the average pH during fasting in healthy adults is

7.5. The highest and the lowest figures on 135 occasions in 31 individuals of ages varying from 20 to 35 was 8.0 and 6.5.

Next the hunger condition may be considered. The manner in which it affects the curve is shown in the first figure. See Fig. 1.

increased salivary alkalinity. McClelland's discovery that the mastication of various substances regardless of their flavour raises salivary alkalinity is, thus, a particular case of a more general phenomenon, for laughing, talking, etc., all raise the alkalinity.

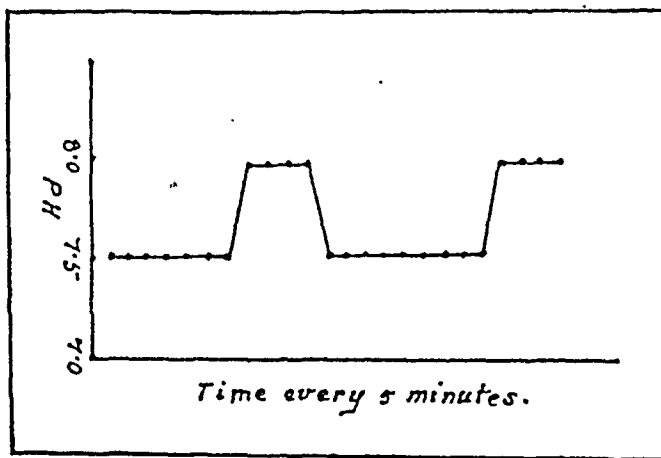


Fig. 1.

The subject of the experiment was a young male adult 20 years old, who fasted for eighteen hours previous to, and during, the experiment. The pH of his saliva, as seen from the figure, was chiefly 7.5, but altered twice to 8. These alterations exactly coincided with hunger pangs, which therefore make saliva more alkaline.

The next figure records the alteration which occurs during defecation. See Fig. 2.

The results so far, then, show that all normal movements of the muscles of the alimentary canal, of which the subject obtains awareness, are associated with an increase in the alkalinity of saliva.

Variations in the reaction of saliva also occur during and after meals. The next figure records the average changes of 62 experiments. See Fig. 3.

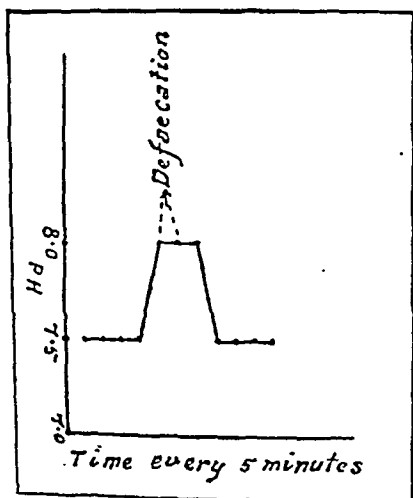


Fig. 2.

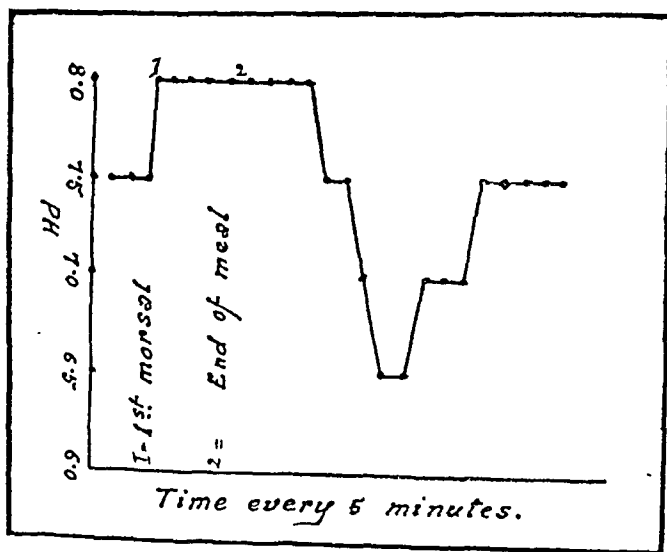


Fig. 3.

The defecation was a morning act taking place ten hours after the last meal, and care was taken to collect the saliva when there were actual sensations of intestinal movements.

I found that any sort of activity of the masticatory and facial muscles was associated with

There were 25 subjects of ages varying from 20 to 35. The experiments were always begun after a fast of at least eight hours, and the reaction of the saliva was estimated every five minutes. Three readings were taken before the meal was begun and it was then found that

they are being advised to collect the meal remaining from the hand pounding, and to consume it in the form of a porridge, or baked in cakes or biscuits. They are being advised to lay in a supply of dried peas, beans, and pulses, during the dry weather, and to keep them stored for consumption during the rains, especially in the germinated condition. They are further being advised not to throw away the water in which their rice is boiled, but to use this as a drink, or as a nucleus for their soups and curries.

In view of the apparent value of fresh toddy as a source of vitamin B, the question of the collection and storage of the excess yeast, which forms on the toddy and is at present discarded, is being examined, in the hope that it may be made use of as a protective food during the endemic season.

#### SUMMARY AND CONCLUSIONS.

What was at first supposed to be a new outbreak of epidemic beriberi in a remote island off the Arakan coast, has turned out to be an unusual incidence of this disease, which has long been endemic on the island.

During the rainy season of 1929 approximately 1,650 cases with 188 deaths occurred among a population of 32,500. The coastal villages suffered most, those in the interior being comparatively free.

The disease is definitely seasonal, its incidence during the rains, July and August being the months in which most cases develop.

While the occurrence of mouldy rice cannot be entirely excluded, there is very definite evidence of diet deficiency, particularly marked in the months of June, July and August. At this season white rice with a meagre and insufficient quantity of salted fish, a few green leaves and bamboo shoots, form the diet in the coastal village.

The villagers in the interior grow most of the vegetables and fruit, including beans, peas, pulses and ground-nuts, and have a sufficiency of these throughout the year.

The villagers make no use of the rice cleanings except to feed cattle and chickens. They further discard the water in which their rice is boiled.

Preventive measures to be tried include the use of red rice instead of white, the consumption by the people of rice cleanings, where rice is hand pounded, the storage of legumes in the hot weather for consumption during the months of June, July and August in the germinated form, and possibly the utilisation of toddy yeast as a food.

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1. The stomach was kept empty—nothing having been taken for eight hours previously.
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3. There were no hunger pangs.
4. During collection the muscles of the face and particularly of mastication were kept at rest.

With these precautions I found that the average pH during fasting in healthy adults is

have an inverse relation to the pH of the gastric juice.

In conclusion I beg to tender my most grateful thanks to Dr. W. Burridge who guided me throughout these investigations. I also express my appreciation of the co-operation of the students who, acting as subjects, made possible this investigation.

#### REFERENCES.

- (1) Mathur, S. N. (1928). Experiments on the digestibility of different kinds of rice and rice preparations. *Indian Med. Gaz.*, September.
- (2) Rich, Gilbert J. (1927). The reaction of human mixed saliva. *Quart. Journ. Exper. Physiol.*, p. 53.
- (3) McClelland, John R. Influence of various stimuli on human saliva. *Amer. Journ. Physiol.*, Vol. LXIII, p. 125.

### CHOPRA'S ANTIMONY TEST IN A NON-ENDEMIC KALA-AZAR AREA.

By P. V. GHARPURÉ, M.D. (Bom.).

(From the Department of Pathology, Grant Medical College, Bombay)

DURING the session of the Congress of the Far Eastern Association of Tropical Medicine held at Calcutta in December 1927, Lieut.-Col. R. N. Chopra of the Calcutta School of Tropical Medicine demonstrated a simple test for diagnosing kala-azar. With a view to find out its efficiency I undertook to carry out some control tests in a non-kala-azar district. A part of this work was commenced in April 1928 at Khandala at Tata Construction Co.'s labour camp, with the kind permission of the Engineer-in-charge and with the co-operation of their Medical Officer, Dr. G. D. Gupta, to both of whom I desire to express my thanks.

**Finger Prick Test.**—The technique of this test as employed in this series was as follows:—

To a small test tube 0.25 c.c. of a 2 per cent. solution of potassium oxalate was added. The perfectly dry finger of the patient was pricked with a needle and the tube inverted over a drop of blood squeezed out of it. So far as possible these drops were of approximately the same size. A little of this was transferred to a miniature test tube with 5 or 6 mm. internal diameter. The tube was then put aside for a few minutes to allow the blood corpuscles to settle and leave a perfectly clear supernatant fluid. To this an equal quantity of a 4 per cent. solution of urea-stibamine was slowly added.

If any tube showed a flocculation or even a precipitate it was considered positive. In order to save time I devised the following method of making blood solutions of different strength.

In a series of small test tubes is put 0.25 c.c., 0.5 c.c., 1 c.c., 2 c.c., etc., respectively of potassium oxalate solution and an approximately uniform drop of the patient's blood is mixed as in the former case. If one drop is put in 0.25 c.c., it makes a 1:5 dilution; the further dilutions are 1:10, 1:20, 1:40, etc. By this method without loss of time I was able to deal with 25 to 30 sera at a time. The only thing required is a large number of test tubes and a

suitable stand for them. The results were recorded as follows:—

TABLE I.

*Shows the results of the finger prick test in a non-endemic kala-azar area.*

Nature of cases.	Total number.	Positive in 1:5 dil.	Positive also in 1:10 and higher dilution.	No precipitate.
Enlarged spleen	135	4	2	131
Fevers ..	53	0	0	53
Malaria ..	61	1	0	63
Tuberculosis	14	0	0	14

From the table it will be seen that the specimens of blood required for the test have been collected from different sources. The group of 135 cases with enlargement of spleen was very interesting. Out of the series, only four cases gave a positive reaction, with 1:5 dilution (i.e., one drop of blood in 0.25 c.c. of potassium oxalate). Out of these four cases, two failed to develop any precipitate in 1:10 or higher dilutions. One of these cases developed acute splenomegaly and ran a continuous enteric-like temperature. His blood was positive to the Widal reaction after three weeks, and the aldehyde test was negative. The other was a case of fever of eighteen months' duration with anæmia, hydræmia and leucopenia and the aldehyde test was positive. This appeared to be a true case of kala-azar but unfortunately blood culture could not be done to definitely settle the diagnosis. Out of 64 definite cases of malaria, only one showed a positive reaction with 1:5 dilution but none in 1:10 dilution. The other two groups including cases of unknown fevers and tuberculosis did not give any positive results at all.

**Serum test.**—With the kind help and co-operation of Dr. P. A. Dalal, Professor of Bacteriology, I had the opportunity of performing the test in 199 different specimens of sera collected for the Wassermann reaction. The results obtained are given below in tabular form:—

TABLE II.

*Results of antimony test with 199 sera sent for Wassermann reaction.*

Nature of cases.	Total number of cases.	Positive whole serum test.	Positive in 1:5 dilution.	1:10 dilution or higher dilution.	No precipitate.
Unknown	199	39	2	0	158

It will be seen from the table that 39 cases gave some precipitate with the whole serum; when 1:5 dilutions were used only 2 cases showed positive results; and when the test was

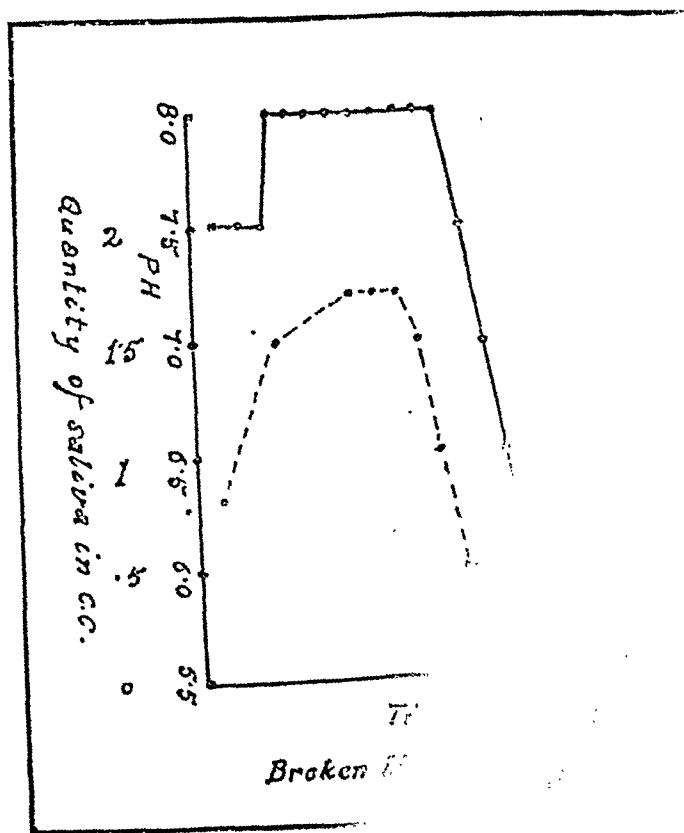


immediately after the first mouthful of food was taken the reaction of the saliva changed. This change was maintained during the meal and for an average time of 15 minutes after—the extremes were 10 and 40 minutes. The reaction then slowly changed and the saliva eventually became definitely acid, but not for long. It finally returned to its fasting value.

Psychic events also cause a rise of salivary alkalinity. For I found that when the mouth is made to water through the sight or smell of food, the alkalinity of the saliva is increased. This increase, however, is temporary and the reaction returns to the fasting level shortly after the psychic disturbance has abated.

But whereas desire for food raises alkalinity, aversion reduces it. One subject had a strong aversion from *sago-kheer*—sago boiled in water flavoured with salt or sugar. He was given some of this sago to swallow without chewing and the pH of his saliva was then found to be 7. Five minutes after taking this undesired food the alkalinity of his saliva rose again to its fasting level.

In some of the experiments, after food had been swallowed, all saliva was allowed to dribble out of the mouth and was collected. I found thereby that the rate of secretion of saliva determined its reaction. See Fig. 4.



A number of experiments were made with certain gaseous and liquid substances with the following results:

Smoking +++  
Alcohol ++

Water ++ — + when thirsty and when no thirst.

Acid ++

Tea —

Alkali Results inconclusive.

(+) denotes rise in alkalinity at fall.

Finally, most of the experiments repeated in infants and children, and that, while their curves were those of the adults, the alkalinity of the saliva was from one to one distinctly lower than in adults.

#### Summary and conclusions

1. Fasting saliva is alkaline. Alkalinity rises during meals.

2. The intestinal movements are associated with a rise in the alkalinity of saliva.

3. Activity of the abdominal muscles is associated with a rise in the alkalinity of saliva.

4. The chewing sensation arouses a rise in the alkalinity of saliva.

5. The degree of alkalinity is determined by the rate of secretion of saliva, which shows regular

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in the green between the B and F lines of the spectrum is characteristic of urobilin.

Note.—If bile be present, remove it by adding 1/5 vol. of 10 per cent.  $\text{CaCl}_2$  and filtering.

Quinine by itself does not lead to the destruction of red cells in such numbers as to give rise to urobilinuria. The test is of further use in cases where quinine may have been given and the detection of malarial parasites may have become difficult. The presence of urobilin in the urine is indicative of functional liver incapacity and very probably of malaria, if the patient be suffering from fever.

Summary.—(1) The presence of urobilin in the urine in cases of fever is, in the vast majority of cases, diagnostic of malarial fever in the tropics.

(2) Examination of the urine for urobilin is still more useful in those cases of malarial fever where quinine has been given and malarial parasites cannot be found microscopically.

(3) In all cases of fever the test for urobilin in the urine should be carried out.

#### CORRIGENDUM.

In the article in our issue for February 1930, p. 75, in the article by Rai Bahadur B. N. Vyas, M.A., on *Cutepepla orbicularis*, on p. 78 under the heading 'Pharmacology,' 2nd para., in place of:—

"Next at  $D_2$  the watery extract in R/10 at pH 10 was perfused" please read "Next at  $D_1$  the watery extract in R/10 at pH 8 was perfused."

## A Mirror of Hospital Practice.

### THE FAILURE OF THE ALKALOIDS OF *HOLARRHENA ANTIDYSENTERICA* (KURCHI) IN THE TREATMENT OF AMOEBIC HEPATITIS.

By R. N. CHOPRA, M.A., M.D. (Cantab.),  
LIEUTENANT-COLONEL, I.M.S.,

and

N. DE, M.B.

(From the Department of Pharmacology, Calcutta School of Tropical Medicine and Hygiene.)

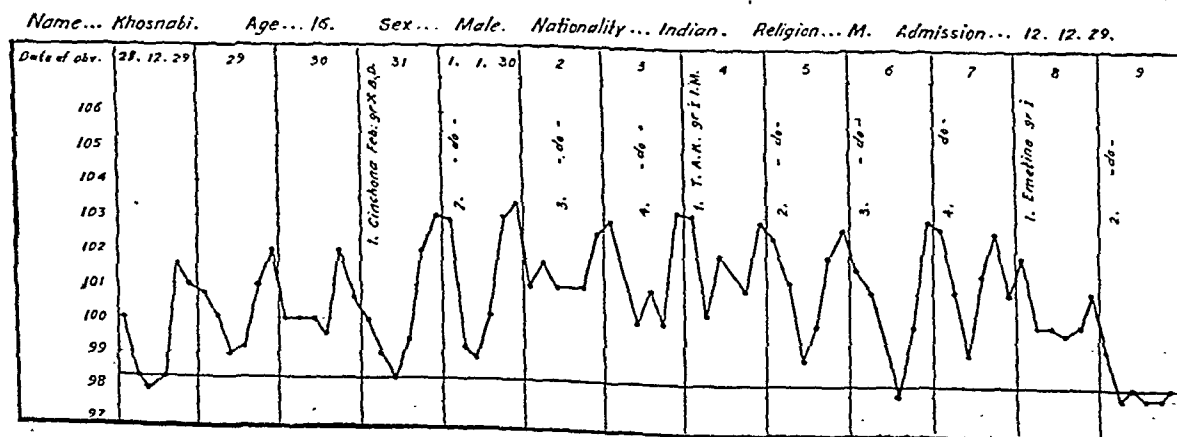
Our experience with the total alkaloids of *Holarrhena antidysenterica* has shown that

they have as powerful an action as emetine in their immediate effects on the symptoms of intestinal amoebiasis as well as in their curative value, in such doses as one grain daily by intramuscular injections. We naturally expected that these alkaloids would be equally effective in amoebic affections of the liver. The following case, however, shows the failure of these alkaloids in controlling the symptoms of a case of hepatitis while emetine produced its usual effect.

Khosnabi, a Mohammedan male, aged 16 years, was admitted on 12th December, 1929, into the Carmichael Hospital for Tropical Diseases. He had been suffering from irregular fever ushered in with rigor for the last two months. During the height of the attack the patient had occasional vomiting. After admission the patient had a daily rise of temperature attended with chill and rigors; the fever lasted for a few hours and the temperature came down to normal with profuse sweating. General condition of the patient on admission was not bad though he was distinctly anemic. Examination showed the respiratory and circulatory systems to be normal. The appetite was good, bowels moved regularly and the liver was slightly enlarged. The spleen could be felt two inches below the costal margin and was hard in consistency. Examination of the blood showed the presence of rings of *P. falciparum*.

The patient was put on quinine sulphate, grains 10, 3 times daily for 7 days, on 21st December 1929, but it failed to bring down the temperature or improve the clinical picture. This was followed by cinchona febrifuge 10 grains twice daily and alkali; but the patient still continued to get fever. On 1st January 1930 the patient complained of pain and tenderness over the right hypochondriac region. The fever continued to be intermittent in type and the rise was attended with rigor. The area of liver dullness increased and slight bulging was noticeable in the lower intercostal spaces between the anterior and mid-axillary lines. Skiagrams of the liver showed well marked enlargement upwards and the shadow was more opaque than usual. Examination of blood at this stage showed:—

Total W. B. C. count	20,000
Polymorphonuclear leucocytes	68
Small mononuclear leucocytes	28
Large mononuclear leucocytes	2
Eosinophiles	2



The patient was put on intramuscular injections of the total alkaloids of *Holarrhena antidysenterica* on 4th January 1930, one grain being given every morning. After four injections, however, there was no improvement and the patient complained of severe pain in the right hypochondriac region. On 8th January 1930, the total alkaloids of *H. antidysenterica* were omitted and emetine hydrochloride was given in doses of 1 grain daily intramuscularly. After the second injection the temperature came down to normal and remained so till the patient was discharged. The patient had altogether six injections of emetine and he steadily improved in general health. On 15th January 1930, the blood examination showed:-

Total W. B. C. . . . .	8,750
Polymorphonuclear leucocytes . . . . .	62 %
Small mononuclear leucocytes . . . . .	62 %
Large mononuclear leucocytes . . . . .	6 %
Eosinophiles . . . . .	2 %

The size of the liver became normal and all tenderness disappeared. The patient was discharged.

#### RESTORATION OF THE CONJUNCTIVAL CUL-DE-SAC IN A CASE OF EXTENSIVE POSTERIOR SYMBLEPHARON.

By M. M. CRUICKSHANK, B.Sc., M.D., CH.M., D.O.M.S.,  
MAJOR, I.M.S.,

Quetta.

POSTERIOR-symblepharon may have its adhesions extending deep into the conjunctival fornices. When the defect is of moderate severity any one of the well established operations will suffice to cure the condition, the important factor being to obtain a deep cul-de-sac. When the defect is extensive and the fornices obliterated, Teale's operation or modifications of Beard's operation for pterygium cannot be expected to effect a cure. A mucous membrane graft must be used and the method of preparing the eye for the graft will necessarily depend on the site and the extent of the symblepharon. Grafts have been obtained from the conjunctiva of the dog and the rabbit but these have not proved satisfactory. Grafts taken from the inner surface of the lip, if cut very thin, give good results. Epithelial grafts cannot be used for ocular conjunctival defects because the normal movements of the lids does not supply sufficient friction to deal with and remove desquamating epithelium, and a conjunctivitis results, unless the piled up epithelium is removed about every ten days with a probe wound round with damp cotton-wool.

After repeated operations for pterygium a condition very similar to posterior symblepharon may develop and the case described, if not primarily due to such operations, was undoubtedly intensified by such.

A sepoy presented himself for examination, requesting that something might be done to remove an ocular disfigurement due to a mass of fibrous tissue extending from the inner canthus on to the cornea of his right eye.

Examination showed what looked like a massive pterygium extending as far as the centre of the cornea, confluent with both upper and lower lid margins to a point vertically above the inner margin of the cornea.

The mass consisted of dense fibrous tissue which had contracted, pulling the lids together and anchoring the eye so firmly that abduction was impossible, and diplopia was present on looking to the right. Upper and lower conjunctival cul-de-sacs did not exist over the affected area, the lid margins and the lids themselves being closely adherent to the globe.

The use of a Stent mould with which to keep the graft in position was considered unnecessary, the defect being confined to the inner half of the eye. Established opinion to the contrary, I decided to use fine silk sutures and stitch the graft, which had necessarily to be a large one, into position.

Cocaine-adrenalin anaesthesia with novocaine infiltration of the lids was used.

The first step was to remove the head of the fibrous tissue mass from the cornea. This was done, as in dealing with a pterygium, with the point of a Graefe knife. Then, undermining the mass toward the inner canthus, it was divided along the line *a-b* (Fig. 1) up to the skin margin. The areas *abc* and *abd*, and the corresponding portions of the lids were freed from the globe with scissors, thus denuding the greater part of the globe of such covering as it had. The globe was now free and full abduction power restored. With two fine silk, double armed, mattress sutures, each fibrous tissue flap was infolded to take the place of palpebral conjunctiva, the sutures being passed through the superior and inferior palpebral skin folds and tied over small gauze rolls on the external surface of the lids. It now remained to cover the globe with a graft of a size sufficient to stretch beyond the edges of the invaginated flaps.

The following anatomical facts, culled from Whitnall's *Anatomy of the Human Orbit*, helped one in estimating the size of the graft required.

The superior conjunctival fornix corresponds nearly with the superior palpebral skin fold. Sappey states that these folds exactly superimpose the lines of reflection of the conjunctiva on to the globe.

The conjunctival fornix lies 8 to 10 mm. from the corneal margin above and below, and 7 mm. from the internal canthus. With the eye closed the conjunctival fornix is distant from the palpebral fissure 20 to 25 mm. above and 9 to 12 mm. below.

With the eye open the conjunctival fornix is distant from the palpebral margin 13 mm. above and 9 mm. below.

Bearing these measurements in mind and the fact that the horizontal folds of the fornices are effaced in occlusion of the lids, it will be

seen that the minimum size of the graft required to remedy the defect was 20 mm. in vertical and 7 mm. in horizontal measurement.

The inner surface of the lower lip was infiltrated with 2 per cent. novocaine, a large Snellen's lid clamp applied and a triangular area of mucous membrane removed, its longest edge measuring 22 mm., its vertical height 10 mm.

Apart from the occurrence of infection, a five to ten per cent. contraction of a mucous membrane graft is all that need be allowed for. In the large graft cut there was a very definite contraction the moment it was freed from the lip. The thinner the graft the less will this primary contraction be, but the most of this contraction becomes undone when the graft is trimmed. It is better to err on the thick side

of the other corners suturing these to bulbar conjunctiva as deeply in the fornices as possible. Two further sutures were used to suture the upper and lower edges of the graft to the margins of the already invaginated folds, forming or replacing palpebral conjunctiva. Until these sutures were passed, and to facilitate their insertion, the mattress sutures were not tied. As the lids were allowed to close the graft was again stroked gently into the fornices. Inter-marginal sutures were not used. A vaseline dressing and pressure bandage were applied. The dressing was removed on the fourth day and the little mucus which had collected cleaned away, and the bandage reapplied. The stitches were removed on the seventh day and the bandage dispensed with. Seen two months later there was no recurrence of the condition,

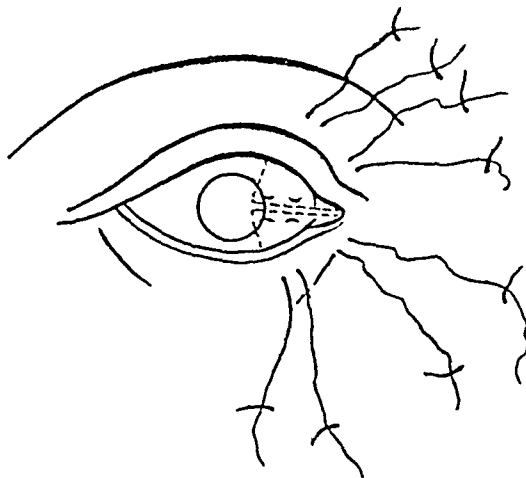
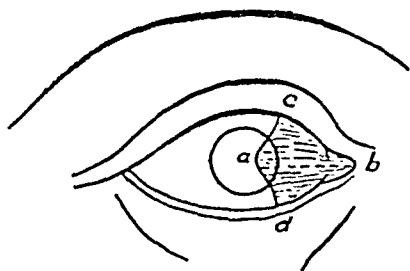


Fig. 1.

in cutting the graft rather than hole it and so render it useless.

It is most important to trim the graft thoroughly because the thinner the graft the more certain is it to take. The method of preparing the graft, described by Macrae (*British Journal of Ophthalmology*, Jan. 1928) is an excellent one. The strip of mucous membrane, when cut, is laid across the palmar aspect of the left index finger, raw surface exposed. The ends or points of the graft can then be controlled by means of the thumb and side of the middle finger, which may be necessary when dealing with a graft which has been cut a little too thickly and thus tends to curl in. All fat and submucous tissue must be removed with a fine scissors, preferably an iris scissors, until the graft is so thin that, unless the graft had been kept on the left index finger, it would be difficult to tell which was the raw surface. While the graft is being trimmed an assistant deals with the lip wound.

The graft thus prepared was placed on the globe, stroked deeply into the fornices, and fixed at each corner by means of three fine silk sutures: one at the apex passing deeply into tissue at the internal canthus; one at each

eye movements were full, and apart from the remaining corneal opacity the disfigurement had been removed.

#### "APPENDIX" IN RELATION TO INGUINAL HERNIA AND A NOTE ON LOCAL ANÆSTHESIA.

By T. S. SHASTRY,  
MAJOR, I.M.S.

(District Medical Officer, North Arcot, Vellore.)

DURING the last fifteen months, there have been 52 cases of inguinal hernia operated on in the Government Pentland Hospital, Vellore, in which the appendix was seen in the contents of the sac in 6 cases.

*Case 1.*—A male, aged 49 years, operated on 22nd February, 1929, for inguinal hernia of right side. Appendix found adherent to the posterior wall of the sac for about 2 inches. The gut could not be delivered, so the sac was tied and pushed in without appendicectomy—modified Bassini's operation under general anæsthesia (chloroform); discharged on 12th March, 1929.

*Case 2.*—A male, aged 45 years, operated on 23rd July, 1929, under chloroform for right inguinal hernia. This proved to be a case of "sliding" hernia. The gut was adherent to the posterior and lower part of the sac. The posterior wall of the sac was composed of

the cæcum and appendix. Appendix was not removed. Modified Bassini's operation was done. Discharged on 7th August, 1929.

*Case 3.*—A male, aged 40 years, operated on 30th September, 1929, under chloroform, for strangulated inguinal hernia of right side. On opening the sac, about 6 ozs. of clear yellow fluid escaped; the cæcum and appendix were in the sac. The cæcum was congested. Constriction was at the neck of the sac. Appendix was removed and contents reduced. The patient was discharged on 14th October, 1929.

These three cases were operated by my predecessor Dr. V. P. Kamath.

*Case 4.*—A male, aged 50 years, admitted on 7th February, 1930, for recurrent obstructed hernia of right side. History of having been operated upon for strangulated inguinal hernia eight years ago in this hospital and of its having recurred two years after the operation. This time the hernia is of 6 years' duration and the obstruction is of 3 days' duration. He sought admission for severe pain in the scrotum and lower abdomen, constipation and vomiting. He had hiccough, and the hernia was irreducible. The tongue was dry. He looked rather emaciated and worn out. Turpentine enemas were given, with no result. The stomach was washed out. Washing showed nothing particular. The hernia was a huge one, the size of a big coconut. He was given a preliminary injection of morphine and atropine subcutaneously, and the operation was done under local infiltration anæsthesia ( $\frac{1}{2}$  per cent. Novocaine solution with 5 minims of liquor adrenaline hydrochloride to an ounce). The scrotum was about  $12 \times 10 \times 6$  inches. The ring of the neck admitted four fingers; the sac was about 9 inches long, fully adherent to inside the scrotum, testes, cord, and the bowels.

Contents of the hernia were: (a) the appendix and cæcum, intimately adherent to the sac; the appendix was 5 inches long and 1 inch in diameter, congested near the cæcal end, the proximal 2 inches were filled with pus; distally it was normal; (b) the ileum which showed congestion and one patch of excoriation. The muscle was exposed and had some adhesions. There was no perforation. About three feet of ileum were lying free in the sac. The contents could not be fully dissected out of the sac. The ileum was pushed in, and the appendix was excised. The sac round the cæcum was purse stringed, so as to cover the cæcum fully, and the whole pushed in and transfixed to the internal oblique muscle. The canal was closed in the usual way. A lot of blood-stained fluid was found in the sac, the cord was cut and the right testis was excised as the cord was very long and adherent. A counter opening was made in the scrotum and a drainage tube left in. He was discharged cured on 9th March, 1930.

*Case 5.*—A male, aged 38 years, operated on for left strangulated inguinal hernia on 14th March, 1930. He was operated on for right-sided hernia ten years ago in this hospital. Turpentine enemas had no effect. The stomach was washed out—nothing abnormal. He was given a preliminary injection of morphine and atropine subcutaneously. Local infiltration anæsthesia was performed. In the sac were found a large amount of mesentery with dark blood extravasation and very congested ileum about 3 feet long. The cæcum and appendix (left-sided hernia) were just above the ring in the abdominal cavity, but came out into the neck of the hernia when he strained. The appendix was very hard and thick and intimately adherent to the cæcum, it was covered by fascia-like membrane, so as to look as if it was incorporated with the cæcum, only the distal  $\frac{1}{2}$  inch was lying somewhat free. The appendix was released and excised, it was four inches in length; and the hernia was reduced. The coils of ileum were contracted to the thickness of the thumb. The operation was completed after Bassini's method. He was discharged cured on 21st April, 1930. The appendix showed chronic inflammation on section.

*Case 6.*—A male, aged 55 years, admitted on 12th March, 1930, was operated on for bubonocoele of the right side on 25th March, 1930, under local infiltration anæsthesia with preliminary morphine and atropine injection. There was no sac at all. The cæcum and appendix were discovered in a meso-cæcum and meso-appendix. The appendix was coiled into  $\frac{2}{3}$  of a circle, a scar was found on the meso-appendix. The appendix was removed. It was normal on section, except for many threadworms. The meso-cæcum was closed round the cæcum. The whole was pushed in, and the external ring closed.

Since January this year, twelve cases of hernia were operated on under local anæsthesia. The procedure was as follows:—Ordinary cases were given castor oil the previous forenoon, and an enema was given the same evening. One hour before operation, a preliminary subcutaneous injection of morphine  $\frac{1}{4}$  gr. and atropine  $\frac{1}{150}$  gr. was given. A solution of Novocaine  $\frac{1}{2}$  per cent. is freshly prepared and sterilized and to it 4 or 5 drops of liquor adrenalin hydrochloride are added, per ounce of the solution, before infiltration. In the line of incision the skin and subcutaneous tissues are infiltrated with the solution, and the operation is commenced 5 to 10 minutes after. The muscular layer is then infiltrated and then the sac. The operation is well borne by almost all patients. Thirty to forty c.cm. of solution were used for each case. The advantages are very many, when compared to general anæsthesia under chloroform.

First, the shock is practically nil. Secondly, there is no post-anæsthetic vomiting or delayed chloroform poisoning. The patient can take nourishment soon after. Usually, we give him some milk and water after operation.

Thirdly, it is specially indicated in diabetic and consumptive subjects.

Fourthly, it is very useful in otherwise diseased and debilitated subjects, who obviously cannot stand chloroform.

Fifthly, you dispense with the necessity of the services of a skilled anæsthetist.

The one point I should stress is that the solution prepared should be absolutely fresh and sterile. I have also done a few of my cases under spinal anæsthesia, which also has given very satisfactory results. The theory that the patients' shoulders or heads ought to be propped up higher than the abdomen for fear of the solution going up the cervical cord and stopping respiration can certainly be ignored. The patients after injection of spinal anæsthetic (either Novocaine or Stovaine) were operated upon in Trendelenberg's position in my work in this hospital, without the least danger.

I have great pleasure in acknowledging the part of my Assistant Superintendent, Dr. A. N. Verghese, L.M.S., and my Sub-Assistant Surgeon, Dr. P. Srinivasan, L.M.P., in preparing these notes.

## Indian Medical Gazette.

JULY.

### THE PRESENT POSITION OF HOOKWORM TREATMENT.

ALTHOUGH the Hookworms have, in all probability, developed as human parasites along with the evolution of Man himself, no record of their recognition as parasites appeared in the literature until Dubini in Italy described *Ancylostoma duodenale* in 1838. This was followed by its discovery in many tropical and sub-tropical countries, but not until 1902, when Stiles described *Necator americanus* in material from Mexico, was it realised that a second species of worm was involved. *A. duodenale* was then recognised as the original hookworm of the Old World, and *N. americanus* occupies a similar position in the New World. A great amount of work has been done since that time, and the distribution of the two species is now fairly well worked out in most countries where they occur. Both species are found in most places, owing to the migrations of Man, and it has been shown by Darling that certain ethnological data can be confirmed by a study of the relative distribution of the two worms in the aborigines of a country, and in the more recent arrivals.

Bilharz in Egypt in 1854 and Wucherer in Brazil in 1866 connected hookworm infection with the anæmias that were common in both these localities. Knowledge of a similar nature was gradually acquired throughout the world, but treatment with the object of getting rid of the causal parasites, was not reported in the literature until Perroncito in 1880 recorded an attempt to eradicate hookworms by the use of extract of male fern. This work was done among the labourers employed on the construction of the St. Gothard tunnel, where an exceptionally heavy hookworm infection in epidemic proportions first made it generally recognised that these worms could cause a serious, and at times even fatal, disease. Perroncito was speedily followed by other Italian physicians, who tried all the well known anthelmintics, such as santonin, which had been used for the larger and better known worm parasites from the earliest times. Not much success attended the use of most of these drugs, but it was soon recognised that thymol was a useful drug for the purpose and practically no other remedy was used for hookworm treatment for the next twenty-five years.

Hookworm treatment on a large scale was first carried out in Porto Rico from the year 1904 onwards, and thymol was the drug

employed. By the year 1913 Ashford, who originated the Porto Rico Commission, reported over 2,000,000 treatments with this drug without a single fatality. About the same time as Ashford and his co-workers commenced operations in Porto Rico, Bentley in Assam advocated beta-naphthol as an alternative to thymol, one of its great advantages being that it was much cheaper than the latter. Beta-naphthol had its advocates in various places, but it gradually fell into disuse and thymol remained as the only drug in general use. The reasons why beta-naphthol became unpopular were that it was not quite so efficient as thymol, it was irritating to the kidneys, and in large doses it had a definitely destructive effect on the red blood cells, especially in malarious subjects, a few fatalities being recorded from its use. During this same period various combinations of chloroform and eucalyptus were recommended by some workers, but these mixtures never gained general recognition, as they were very inefficient in the removal of worms, and their use was attended by a certain amount of danger.

The study of hookworm disease in general and especially with regard to its treatment received a strong impetus when the attention of John D. Rockefeller was first attracted to the problem, and his interest aroused by Stiles in 1909 who, with the financial aid of Rockefeller, organised a Commission to study the hookworm problem in the Southern United States. After about four years' work valuable results were produced by this Commission, which employed both general treatment of the population and sanitary education.

It had gradually become recognised that the prosperity of the whole tropical and sub-tropical belts encircling the world was more or less affected by the hookworm infections of their inhabitants, and as a result of the favourable results obtained in America, it was decided to establish the Rockefeller Foundation in the year 1913. The original objects of this Foundation were to push the treatment, and as far as possible eradicate hookworm infection from any countries where it was a serious economic problem. This work, made possible by the almost unlimited financial resources of Rockefeller, spread rapidly, and soon millions of people of many races were being treated.

One of the objections to thymol is its expense, and when such very large numbers were being treated the cost of the drug became a very serious problem, with the result that a search was begun for a cheaper but efficient substitute. *Chenopodium*, which had long been known to have anthelmintic properties, was reported by Schüffner and Vervoort to be a powerful agent against hookworms, just about the time that the Rockefeller Foundation began operations. Under the world-wide organization of this body of workers oil of *chenopodium*



became practically the universal treatment for hookworm in a remarkably short time. In the first few years of its use the results in various parts of the world were somewhat conflicting. The reason for this was that the proportion of active principle (Ascaridol) present in different samples of the oil was found to vary considerably, and as the drug was produced in large quantities in different parts of the world its effects were very variable. This difficulty has been overcome and oil of chenopodium now on the market is properly standardised, and is of a uniform efficiency. Another objection to the oil, in the early days of its use, was that several severe cases of poisoning were reported, and some of these ended fatally. These deaths were due to impure samples of the drug and in some cases to over-dosage, but now that the drug is procurable in a pure state and the proper dosage is laid down these accidents have ceased to occur, and it is now considered to be a perfectly safe drug if used properly.

Oil of chenopodium held sway as the almost universal anthelmintic for hookworm treatment for nearly eight years, until Hall in 1921 recommended carbon tetrachloride. This was by far the most efficient and the cheapest drug yet discovered for hookworm treatment, and it had soon been tried in practically all countries where there is a hookworm problem. The first report of its use on a large scale was that of Lambert who treated about 50,000 cases in Fiji without any fatalities; this coupled with Hall's original report probably gave the general impression that carbon tetrachloride was a non-toxic drug. It is probably not generally realised that in Fiji Lambert was dealing with a non-malarious and in every way an exceptionally healthy tropical population, and despite this fact he had two deaths from the use of carbon tetrachloride in quick succession, after his original large number of successful cases.

In other countries, where the medical men, possibly not aware of the special favourable conditions in Fiji, and in consequence led to the opinion from Lambert's early report that carbon tetrachloride was a perfectly safe drug, in all probability began to use it on less healthy communities without taking any precautions. At all events reports of deaths attributable to carbon tetrachloride began to appear in the literature, from various places. Considering the enormous number of treatments that have been given with this drug, the number of deaths is not great, but from the fact that the disease for which the treatment is given is almost never fatal the deaths are naturally regarded more seriously than are deaths caused by new drugs in other diseases, which would most likely be fatal if no treatment were given.

The tea districts of Assam have had a fairly heavy death roll from carbon tetrachloride, but not many of these cases have been reported

in medical literature. As a result of these unfortunate occurrences the use of this valuable drug has been discontinued in many gardens. We have made extensive inquiries into these deaths and it is a striking fact that in some cases two or three deaths have occurred in a few hundred treatments, whereas one tea company doctor has a record of over 12,000 treatments without a single fatality, and another large industrial organization in Assam has treated more than 32,000 people with a like result. The coolies treated in these two cases are the same as other coolies in Assam, and they are living under similar conditions, so it seems possible that the method of administering the drug, or lack of necessary precautions, may be at fault in some cases, rather than the drug itself. As an example of an unusual method of administering carbon tetrachloride being a possible cause of deaths we have a report of three deaths in two hundred and forty treatments, and the method employed was to give croton oil with the carbon tetrachloride. The only authority for this unusual, and we venture to suggest unsafe, manner of giving carbon tetrachloride, which we have been able to find, is in an annual report of the P. M. O. of British New Guinea, who said he used it because the transport of large packages of magnesium sulphate through the densely wooded and mountainous interior was a great difficulty. Though there is no doubt that small bottles of croton oil are much easier carried than hundredweights of magnesium sulphate and that the former has therefore an undoubted advantage over the latter, where transport is difficult; there is no subsequent report, of which we are aware, that gives information as to whether deaths occurred in the outlying villages in which this form of treatment was adopted. It is difficult to understand why such a form of treatment was followed on a tea garden where transport of drugs is of no consideration.

Our own experience in Calcutta of the use of carbon tetrachloride, which is now of about nine years' duration, has been as fortunate as the two above quoted cases, for we have never had a death following its use, although it has been employed in all suitable cases, both in-patient and out-patient, ever since it was introduced. By suitable cases, it is meant those, which on the most cursory examination show no gross liver disease or fever at the time of treatment, and these are all the precautions we have ever taken. On account of the deaths that have occurred certain writers have of late advocated the total abandonment of carbon tetrachloride for hookworm treatment, and have recommended a return to the less efficient thymol or oil of chenopodium. Though no deaths have been reported from thymol in therapeutic doses it is agreed by all acquainted with the drug, that strict dietetic precautions

must be taken, or severe toxic symptoms will arise. In view of the stringent precautions that are necessary, it hardly seems reasonable to call thymol a perfectly safe drug. Though the use of thymol has not been followed by fatalities, dietetic precautions have been insisted upon ever since it was used on a large scale. It was first used over a long period of years in treating individual cases, and thus the knowledge of the precautions necessary and of its contra-indications were gradually acquired, so that when the time came for its use on a large scale the pharmacology and therapeutics of the drug were fully understood. On the other hand both oil of chenopodium and carbon tetrachloride were suddenly introduced and large scale treatments were embarked upon immediately. The result was that deaths from both drugs occurred in the early days of their use, before they were properly standardised and purified, and before their pharmacological action was fully known. These objections now seem to have been quite overcome in the case of oil of chenopodium, but although perfectly pure carbon tetrachloride is now easily obtainable and the results of its use have been much improved, it must be admitted that a death following its use is still occasionally reported.

Carbon tetrachloride was originally hailed as a drug that was perfectly safe, and as one that could be given without any dietetic precautions or preliminary preparation of the patient, and now that it is recognised certain contra-indications exist, the most important of which are the use of alcohol near the time of administration of the dose and gross liver disease, there seems to be some reluctance on the part of medical men to retract from the original idea, and to take the necessary precautions. If it is given an equal chance with thymol and the precautions necessary to observe in giving carbon tetrachloride are as carefully observed as is invariably the case with the former drug, we consider one remedy is as safe as the other. It is true that one or two deaths following doses of 3 c.c. or less of carbon tetrachloride have been reported, where all due precautions appear to have been taken, and which can only be explained by individual idiosyncrasy, but the number of cases of this kind is exceedingly small and it is probably that the death rate from this cause is no greater than that due to mechanical vehicles of one kind or another, and we know of no advocates for scrapping railways, motors, aeroplanes, etc., and for returning to animal transport on account of deaths from these machines.

Tetrachlorethylene has been recommended during the past two or three years as a possible substitute for carbon tetrachloride, but from the reports so far available, and from our own experience of the drug, we think it has no advantages over the latter and it is unlikely to replace it to any extent.

Another method of treatment now in vogue, and one which seems especially valuable, is a combination of carbon tetrachloride and oil of chenopodium, or of its active principle ascaridol. The argument in support of this combination is a sound one, for it is that the toxic effects of the two drugs bear on different systems in the human being, so that the added effect of both drugs is gained on the hookworms and the toxic effect on the patient is not increased. Another valuable point in the use of this mixture in countries where *Ascaris* is common, is that the oil of chenopodium portion of the mixture is fairly effective against these worms as well. A good many reports of the use of the mixture of these two drugs in varying proportions have been published, but we think more work is necessary before the optimum mixture is found. From our work on these lines, which is still in the experimental stage, we are very favourably impressed with its value, and unless a better remedy is found, we consider that the best available treatment of hookworm infection from all aspects will eventually be found in the mixture of these two anthelmintics.

It is evident that the advance in anti-hookworm therapy has been very great, since it was first begun, but it is not yet perfect. This happy state will not be reached until we have at our disposal a cheap drug, relatively as non-toxic as Epsom salts, and a single dose of which will be certain to remove all the hookworms present in an individual.

P. A. M.

## Medical News.

### THE HENRY HILL HICKMAN CENTENARY EXHIBITION, 1830-1930.

THE Wellcome Historical Medical Museum has already placed the medical profession of Great Britain, as well as those practising in the tropics, under a debt of obligation to it. The present year sees the centenary of Hickman's death, and in connection with an address on "Henry Hill Hickman, the English pioneer in anaesthesia" by Lord Dawson of Penn at the Royal Society of Medicine, the Wellcome Foundation have issued a most charming book giving a complete account of Hickman's life and researches. The book is published in the sumptuous style which we are accustomed to in the publications of the Wellcome Bureau, profusely illustrated, and has a charming portrait of Hickman, and a reproduction of an oil painting of Hickman experimenting with anaesthesia on animals.

The search for anaesthesia for surgical operations is age-old. It is probable that the Incas tried to deaden pain by the local application of chewed coca leaves. Up to the end of the eighteenth century numerous stupefying drinks were in vogue. In 1800 Humphry Davy, who was then employed by Beddoes in his Pneumatic Institution at Clifton, began to study the inhalation of gases, and especially nitrous oxide. Nerve compression was also resorted to; but at that date gases were chiefly used in the treatment of pulmonary disorders, and not as anaesthetics.

Hickman was born in 1800, and qualified in 1820. In the course of his professional career he practised as a

general practitioner at Ludlow, Shifnal and Tenbury. As a member of the Edinburgh Medical Society he probably knew of the current experiments of Beddoes and others, and his attention was especially drawn to the possibility of inducing anaesthesia by semi-asphyxiation. In 1824 he wrote a full account of his researches to Mr. T. A. Knight of Downton Castle, near Ludlow, a Fellow of the Royal Society. In this he explained how he had exposed dogs, puppies, rabbits and mice to semi-asphyxiation, either by sealing them under bell jars from which air was excluded, or by making them inhale carbon dioxide, and had performed on them various surgical operations such as the removal of an ear or limb, or incisions and suture. The animals had been completely insensitive, and hæmorrhage was reduced to a minimum. In the same year he published a popular pamphlet in which he gave full details of these experiments. He was convinced that not only was there complete anaesthesia, but that in careful hands the method was safe.

Hickman's work, however, was ignored by the medical men of his own country, and in April 1828 he travelled to Paris and addressed a memorial to King Charles X. This memorial is copied in the book, both in the text and in photogravure. Charles X referred the matter to the Académie Royale de Médecine, at that time the most illustrious medical society in the world. A Commission was nominated to examine Hickman's evidence and repeat his experiments, but unfortunately there is no record of their findings. Baron Larrey, formerly Surgeon-General to the Emperor Napoleon, was about the only one who supported him.

Hickman returned to England, and died at the early age of thirty at Bromfield in 1830. Subsequently in 1847 Dr. T. Dudley brought the early work of Hickman to the notice of the *Lancet*, upholding the claims of priority for Hickman in the induction of surgical anaesthesia. The use of ether came later, whilst nitrous oxide in dental work was introduced about 1845.

There can be no doubt that Hickman was the pioneer of surgical anaesthesia by the inhalation of gases. Where others were using such gases in the treatment of pulmonary diseases, he saw and investigated the possibilities of using them to produce surgical anaesthesia. In a foreword to the book, Dr. Dudley Buxton writes as follows:—

"Hickman recognised that vapours introduced into the lungs and thence into the circulation of the blood should provide a means of ensuring sleep for the sufferers who had to face the surgeon's knife. He grasped the principle—the method was to follow. We must appreciate in Hickman the true scientist. He set about to prove the principle by adopting the correct methods of research. His experiments are remarkable, when we envisage the days in which he lived; also they are accurate, so far as the physiology of his day could make them. He sought for a means whereby he could produce anaesthesia in animals by inhalation, and he adopted recognised gases as a means of arriving at this end. Further, he believed that his methods would not only lead him to the discovery of anaesthesia, but would also enable him to prevent hæmorrhage. Unfortunately, his protocols do not supply all the details of the experiments, though we are led to rather than asphyxia was the result. As along which his investigations were conducted with carbon dioxide was certainly along a long way ahead of his time."

In collecting and collating the information contained in this charmingly illustrated souvenir, the Wellcome Historical Medical Museum have made a notable contribution to the history of medicine.

#### PRIZES FOR YOUNG MEDICAL WOMEN

At a recent meeting of the Council of Medical Women in India, it was decided to offer prizes for essays written by young medical women. Prizes of Rs. 100 are offered to women

and two prizes of Rs. 100 and Rs. 50 are offered to women sub-assistant surgeons or holders of the L.C.P.&S. qualification. The subject prescribed in both cases is "Puerperal Sepsis," and the essay should be illustrated by not more than three clinical cases. The entrants must have completed their professional training within the preceding 5 years. Essays should not exceed 2,000 words in length, and must be sent to—

Dr. E. M. Farrer, M.B., B.S. (Lond.),

Hon. Secretary, Association of Medical

Women in India,

Farrer Hospital,

Bhiwani, Punjab,

before the 1st September, 1930.

The best of the essays will be published in the *Journal of the Association*.

#### WANTED, BACK NUMBERS.

THE International Council of Ophthalmology has started an International Library of Ophthalmology in Leyden, Germany, and Dr. Marx, the Secretary, has approached us through Lieut.-Col. R. E. Wright, I.M.S., of Madras, asking whether it is possible to secure copies of ophthalmological articles which have appeared in the medical journals in India.

We believe that most of such articles have appeared in the columns of this journal, during the present century. If any of our subscribers has a complete set of back volumes of the *Indian Medical Gazette*, for as many years as possible, and can spare them, it would be a most graceful action if he would present them to the International Library at Leyden. Unfortunately, there is only one file copy of back numbers in the publishers' office, and one file copy in the editorial office.

The Editor would be very glad to get into touch with any subscriber who would be prepared to make such a gift, or to sell a set of back volumes at a low price. Also, we would invite authors of ophthalmological articles to send reprints to the International Library of Ophthalmology at Leyden.

#### AN ALFRED FRIPP MEMORIAL.

OLD Guy's men will be interested in the proposal to raise a "Sir Alfred Fripp Memorial Fund," the total proceeds of which will be applied as a permanent tribute to the late Sir Alfred Fripp for the benefit of the Children's Department of Guy's Hospital. We have received the following note from Major Ian Hay Beith, C.B.E., M.C., with regard to this project:—

Only one form of memorial seems possible for Sir Alfred Fripp. His whole life can be summed up in the single lovely phrase, "All sick persons and young children." Therefore to perpetuate his memory best, let us do something to perpetuate that life's work. Though all the world was his parish, children came first. So it is proposed that all who knew him, or knew of him—and who did not?—shall be invited to subscribe, according to their means and inclination, to a Memorial Fund to be devoted to the development and extension of the Children's Department of Guy's Hospital, for the purpose of endowing cots, building a new ward, or in any other manner as the Governors of the Hospital or Sir Alfred's own relatives may decide. No tribute has ever been placed on him more. Indeed, during his last years, the Children's Department was his

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Governors of Guy's Hospital, with which Sir Alfred was closely associated as a student, surgeon and governor for over 40 years, to be devoted by them to one or more of the projects mentioned above.

## Current Topics.

### "Medicine" Analytical Reviews of General Medicine, Neurology, and Pediatrics.

The medical and research worker who requires a summary of the whole of the information wanted on one particular subject in which he is interested often finds it difficult to obtain such information. Usually monographs of this type are published as books, more rarely as essay-reviews in medical journals.

In this connection, we should like to bring to the notice of our readers, the journal *Medicine, Analytical Reviews of General Medicine, Neurology, and Pediatrics*, published by the Williams & Wilkins Co., Baltimore, U. S. A. Each annual volume consists of 500 pp.; the annual subscription is 21s. net, with 2s. 6d. postage, and the English agents are Messrs. Baillière, Tindall & Cox, 7 & 8, Henrietta Street, Covent Garden, London, W.C. 2. Single copies are priced at 6s. 9d.

With regard to general medicine, neurology, pharmacology, and pediatrics, this journal furnishes exactly the type of information wanted. Vol. IX, No. 1, for February 1930, for instance, consists entirely of a monograph on the subject of ephedrine and related substances by Drs. K. K. Chen and Carl F. Schmidt of the Johns Hopkins University, in 117 pages. There is here collected in succinct and summary form our knowledge with regard to ephedrine, together with a most useful bibliography up to November 1st, 1929. The various sections deal with the history of ephedrine, its pharmacology and chemistry, its pharmacological actions, its clinical applications and therapeutic uses, and the action of synthetic ephedrine and compounds optically isomeric with or related to ephedrine. Under the heading of therapeutic uses, the value of ephedrine is discussed in connection with asthma, hay fever, bronchitis, emphysema and whooping cough; in conjunction with spinal anaesthesia, in hypotension, shock, Adams-Stokes' syndrome; its use as a nasal astringent and as a mydriatic, as an antidote for narcotic drugs; in dermatology, leprosy, and in dysmenorrhœa.

The reader will find in a monograph such as this complete information on the one subject which he requires, and a full bibliography. In the concluding section, the authors give the following very brief summary with regard to the drug from the practical point of view:—

(1) Ephedrine is the chief active principle occurring in the Asiatic species of *Ephedra*. The other constituents that are present in the Chinese species are pseudoephedrine, nor-d-pseudoephedrine, l-methylephedrine, and d-methylpseudoephedrine.

(2) Ephedrine is a stable compound. Its solutions are not decomposed on exposure to air, light or heat, or by long standing.

(3) Ephedrine has been successfully synthesized by various methods.

(4) In mammals, ephedrine in suitable doses raises the blood pressure, increases cardiac activity, dilates the pupil, relieves broncho-spasm, contracts the uterus, more frequently inhibits than stimulates the gastrointestinal tract. These effects can be explained by the stimulation of the myoneural junctions of the sympathetic fibres. In certain instances, there is an additional stimulation of the ganglia. It has been claimed by some investigators that it acts on the smooth muscles.

(5) In animals, ephedrine does not have a marked effect on any of the body secretions.

(6) There is an increase in the formed elements of the blood and hyperglycæmia, following the administration of a suitable quantity of ephedrine.

(7) Ephedrine increases slightly the basal metabolic rate and the oxygen consumption.

(8) Ephedrine may stimulate the central nervous system.

(9) Ephedrine is easily absorbed and has a low toxicity.

(10) In clinical use, ephedrine can be applied locally and given by mouth or by injection. Individuals who do not have a vago-sympathetic equilibrium may experience untoward symptoms.

(11) Ephedrine has been used with success in the treatment of bronchial asthma, hay fever, whooping cough, bronchitis, postural hypotension and Adams-Stokes' syndrome, in combating the fall of blood pressure in spinal anaesthesia, in antagonizing the action of narcotic drugs, in shrinking the congested nasal mucous membrane, and in dilating the pupil for ophthalmic examination. Its value in dermatology, shock and dysmenorrhœa is promising.

(12) Compared with epinephrine, ephedrine has a less intense but more prolonged action.

(13) Of the many synthetic compounds, dl-ephedrine and dl-nor-ephedrine deserve more extensive clinical trials.

### The Calcutta Water Supply.

We have recently received a reprint from the *Medical Review of Reviews* for January 1930, in which "Health Officer, M.B., D.P.H." makes drastic comments on the filtered water supply of Calcutta city. As his conclusions are based upon considerable personal laboratory observations, they deserve some consideration.

The main filtered water supply was supplemented in March 1929 by the opening of a new 60" main pipe. The official opening ceremony unfortunately proved a failure, for when the Mayor of Calcutta opened the floodgate not a drop of water flowed. Later, when the supply was established, some 9 million gallons of water infected from the mains before they were scoured clean, was run into an underground reservoir at Talla, but about 4 million more gallons, it is stated, were left in the mains, and residents in Calcutta began to find that the filtered water showed a brown sediment and smelt strongly of chlorine.

The Calcutta supply is derived from the Hughli at Palta, a point beyond the saline area during flood tide. The raw river water is stored for 3 or 4 days in sedimentation tanks before it is passed on to the filter beds, and the water, thus settled and stored, is of a high degree of purity. It is then filtered in huge filter beds. These are not efficacious until the zoogeal scum has formed on the surface of the fine sand on the floor of the filter and here the author contends that the beds are scraped far too frequently, whilst he emphatically condemns the proposal to cover the filter beds, as this will shut out the beneficial sterilising action of the tropical sun on the water. A stiff dose of chlorine, he claims, is no substitute for proper slow filtration; at present the filters are scraped every 3 to 4 weeks, and renewed every 9 to 12 months—intervals which he considers much too short.

From the filter beds the water is distributed by 60", 48", and 42" mains from a central pumping station, which has replaced the former four distributing centres. The water, as it leaves the filter beds, is entirely satisfactory. Here the author considers the distribution system to be entirely unsatisfactory. The mains are often laid close to, or even in, sewers; the pressure is at times so low that sewage is sucked into the pipes, whilst the immense increase in motor traffic of recent years subjects the mains to vibration and leads to leakage. A very striking graph month by month contrasts the purity in bacteriological content of the water as it leaves the Talla reservoir with that of the town supply as received. Contamination is at its maximum in July, but is fairly high during the period April to November. Indeed the water, as received, has sometimes a faecal odour.

It is proposed to remedy this state of affairs by super-chlorination at the reservoir, but the author

considers this impracticable; extra chlorine added at the reservoir head will not prevent contamination with sewage due to low pressure and leaky mains, and also excess of chlorine in the water may itself lead to gastro-intestinal troubles. Quotations from leading authorities are given to show the uselessness of such a proposal. Further, the chlorine may not be without action on the steel pipes.

In brief, "Health Officer's" main contention is that to rely on chlorination to render the Calcutta filtered water supply safe is a bad policy. The filter beds should be scraped at much longer intervals than at present; distribution must be through pipes with sound joints; and chlorination is only justifiable during the monsoon months. "There is no justification for chlorination if it is adopted to attempt to charge filtered water with doses of chlorine as a safeguard against any pollution that may take place in its progress through leaky distribution pipes."

### Parathyroid and Menstrual Bleeding.

(Abstracted from *The Prescriber*, Vol. XXIII, No. 9, September, 1929, p. 318.)

EXPERIMENTS have been carried out with parathyroid hormone in the control of excessive menstrual bleeding. The treatment is based on (a) the increased coagulability of the blood met with in hypercalcaemia, and (b) the possible relationship between the ovarian and parathyroid secretions. Fourteen young women suffering from severe menorrhagia were treated with hypodermic injections of "parathormone," 40 units being given daily for five days, combined with 120 to 180 grains of calcium carbonate or lactate daily by mouth. The results are described as good in five patients, fair in six, and poor in three. Calcium levels bordering on hypercalcaemia were obtained in only five cases, and in these the patients complained of headache, nausea, and a rapid pulse. Bleeding ceased at these levels.

### An Important Sign in Acute Appendicitis.

By F. W. SUMNER, M.D., B.Ch. (Cantab.), F.R.C.S. (Ed.).  
(Abstracted from *The British Med. Journ.*, January 18th, 1930, p. 106.)

Most cases of acute appendicitis present no difficulty in diagnosis. The sudden abdominal pain, first, possibly, in the upper part of the abdomen, then localizing in the right iliac region, the nausea or vomiting, the hyperæsthesia and/or tenderness on gentle palpation of the right iliac fossa, the rigid abdominal wall, either limited to the right iliac region or general—all these signs and symptoms present a picture which the veriest tyro can recognize. The possible presence of right-sided localized tenderness or swelling on rectal examination, pain felt in the right iliac region when sudden pressure is made over the left iliac region, pain evoked on suddenly bringing into action the muscles upon which an inflamed appendix lies, an increased rectal temperature, are still further corroborative signs, one or more of which may be present.

In a large number of cases, however, a patient complains of slight abdominal pain in the right iliac region, but there are none of the above-noted signs or symptoms. There is a clean tongue, normal temperature, normal pulse, no pain or tenderness on movement, no nausea, no vomiting, no rigidity, and no abnormality discovered rectally; in fact, there is simply a "stomach ache." In the course of the last few years I have had at least a dozen such cases where I was yet able correctly to diagnose acute appendicitis, in each case an immediate operation demonstrating the appendix to be either inflamed or full of pus, or ulcerated.

Such apparently mild cases with no distinguishing signs or symptoms place one on the horns of a dilemma: if one diagnoses acute appendicitis and removes an appendix which proves to be normal, one is rightly

blamed for performing a needless operation; if, on the other hand, one decides against appendix trouble, and a few hours or days show definitely that appendicitis is present, with possibly disaster resulting from delay in operation, then one is impaled on the other horn. Auto-suggestion may give rise to many of the symptoms of appendicitis, especially in young susceptible people, and these constitute the larger bulk of difficult cases; children form another large class; but there are also a large number of cases of acute appendicitis with practically no signs or symptoms.

For some years I have noticed that in all cases of acute appendicitis one sign, not mentioned in the textbooks, is invariably present at the onset. It is the state of the abdominal wall covering the right iliac fossa, and is produced by the earliest reflex of the inflamed appendix. This reflex may, indeed, produce the classical "rigidity" in severe cases where the onset of the appendix inflammation is very sudden and acute, particularly in those cases where the appendix contents are under pressure from a blockage of its lumen or are of great virulence; but in just such cases there is no difficulty in diagnosis. The earliest reflex may, however, result in nothing more than an increase of the normal tone of the muscle covering the right iliac fossa, and is definitely appreciable to careful palpation. This slight tightening of the muscle has to be carefully searched for, and all voluntary contraction of the abdominal muscles must be obliterated. The patient lies on his back, limp, his arms by his sides, breathing freely with his mouth wide open, his tongue protruded, and his glottis open (making no noise on respiration). The warmed hand of the surgeon is then placed on the lower abdomen, the metacarpo-phalangeal joints resting on the pubes and the fingers kept rigid, together, extended, and pointing first to the right clavicle when examining the right side and to the left clavicle when examining the left side; by a gentle movement of the metacarpo-phalangeal joints, wrist, and elbow, and without any deep pressure of the phalanges, the muscle tone of the two sides is several times compared, when it will be found that there is a definite increase of tone on the right side as compared with the left.

It is a very delicate palpation, but is worth carefully cultivating. I regard it in my practice as a definite deciding factor in doubtful cases, and it has never let me down. The fact that it is an objective sign and not under the control of the patient makes it of the utmost value.

Another little but important point is always to treat a possibly inflamed appendix very gently and not to palpate deeply, for even in what appears to be the mildest of cases there may be an ulcer on the point of perforating, or the appendix may be acutely distended with pus. In two cases I have known rough handling result in perforation and death.

Of course, this sign by no means rules out chest troubles or stone in the kidney or ureter, or some other lesion of the bowel (for example, volvulus or intussusception), or a twisted pedicle of an ovarian cyst; but these, and other conditions in which the sign may be present carry other well-defined signs and symptoms. In one such case with mild symptoms of abdominal pain but with definitely increased right iliac muscle tone the appendix proved to be adherent to the right ovary from old inflammation, thus producing the common menstrual appendix pain. In another patient sent to hospital as suffering from acute appendicitis, where many symptoms were present but this sign was absent, a diagnosis of small ovarian cyst was made, and this was in due course removed.

### Test for Intestinal Putrefaction.

(Abstracted from *The Prescriber*, Vol. XXIII, No. 9, September, 1929, p. 318.)

It has been pointed out that tyrosine is liberated at a very early stage in digestion. If intermediate products of tyrosine putrefaction appear in the urine,



it can be assumed that protein digestion is proceeding in a contaminated medium. The first stages of disintegration yield tyramine and the corresponding hydroxyacid, into which tyramine is converted by the liver before excretion. This substance, p-hydroxyphenyl-acetic acid, furnishes the chemical basis for the following test: To 50 c.c. of urine add 5 c.c. of 25 per cent. sulphuric acid and extract by shaking with 15 c.c. of ether. Pour off 2 c.c. of the ether into a dry tube and evaporate by dipping into hot water. Take up the residue in 2 c.c. of water. Add Millon's reagent drop by drop and boil. A positive reaction is indicated by a red coloration. As cheese frequently contains tyramine, a positive reaction is not specific if cheese has been taken during the preceding twenty-four hours. Salicylates (including aspirin) give a similar coloration, but their presence can be revealed by adding ferric chloride to a duplicate ethereal extract and noting the purple colour. (Millon's reagent is made by dissolving mercury, 3 c.c., in fuming nitric acid, 27 c.c., without heat, and diluting the resulting solution with an equal volume of distilled water.)

### Pain in the Iliac Fossa.

By JOHN FRASER, M.D., F.R.C.S. (Ed.).

(Abstracted from *The British Med. Journ.*, January 18th, 1930, p. 97.)

#### 1. The Appendix.

I consider this aspect of this problem first because it is still a common conception that pain in the right iliac fossa is appendicular in its source. It is one of those dogmatisms which possess a half-measure of truth, and yet possess also a great background of potential error. Many writers and observers have striven to clarify the position. Sherren, for example, has expressed in so many words the almost startling paradox that when pain develops *ab initio* in the right iliac fossa the chances are that, whatever the clinical condition may be, the one it is most unlikely to be is appendicitis. Others have made the same declaration, but, in spite of these and similar statements, the impression remains, with the result that untold numbers of cases have undergone the operation for appendicitis when, whatever may have been the explanation, it was certainly not the appendix which was at fault.

When an individual develops appendicitis three processes are presumed to be responsible for the production of pain, and the events may follow one another in sequence or may occur in combination. The processes are:

(a) Severe spasmodic contraction of the related hollow viscera, the lowest coils of the ileum, the cæcum, and the pyloric portion of the stomach.

(b) Increased tension within the appendix.

(c) An infection of the related peritoneum.

The first of these, by undue contraction of the fibres of the involuntary muscle, stimulates nerve endings which communicate their disturbance to overlying parts, usually to the body mid-line in the supra-umbilical and umbilical regions. As the more local appendicular tension increases, afferent stimuli are transmitted through the medium of the tenth and eleventh dorsal nerves, which results in a diffuse pain in the sub-umbilical region on one side of the mid-line. With the third stage of the development of the disease—the infection of the related peritoneum—there is localized tenderness, both subjective and objective, which de-limits itself at the situation which the appendix occupies, and, as this in some 85 per cent. of cases is at McBurney's point, there is local pain in the right iliac fossa.

What has been the sequence of events? There has been an epigastric or umbilical pain followed by a diffuse sub-umbilical pain, and only with the third stage is there localized right iliac pain. The sequence is of great importance in the matter of differential diagnosis, and as far as my experience goes I am in agreement with the statement which Sherren and others have made—that, if pain begins and remains in the

right iliac fossa, the chances are that the case is not one of appendicitis.

I have said that the appendix occupies the right iliac fossa in some 85 per cent. of cases; in the remaining 15 per cent. it is accommodated elsewhere in the pelvis—beneath the mesentery of the small intestine, below the pylorus with an undescended cæcum, or in the cellular tissue of the retrocæcal region. In all these instances, which may be termed anomalies of position, there may be no pain in the right iliac fossa, it is supra-pubic or sub-umbilical, or subcostal, or in the loin, according to the position which the organ occupies. My point is this, that right iliac pain as an evidence of appendicitis depends upon the organ occupying what is supposed to be its normal anatomical position, and, moreover, that its appearance is an evidence of a stage in the local pathology which bespeaks an established infection of the organ with peritoneal involvement.

### The General Medical Council: Its Functions and Powers.

(*The Edinburgh Med. Journ.*, Vol. XXXVII, No. 4, April, 1930, p. 249.)

WHAT does the General Medical Council stand for; what is it empowered to do; and what does it actually do? These are questions about which there still appears to be considerable dubiety, not only in the minds of laymen, but even among members of the medical profession. They were authoritatively answered in a speech recently made in Edinburgh by the President of the Council, Sir Donald MacAlister.

In the course of his speech Sir Donald said:—

"..... The Council's critics do not seem to realise that it is not a voluntary body for the promotion of professional interests, or for 'putting down quackery,' or for discovering 'cures' for cancer and tuberculosis. It is concerned with none of these, yet is constantly chided for neglecting them—in fact it is precluded by its statutory constitution from meddling with any of them, however important they may be.

"It is, on the other hand, a creation of the State, whose composition and functions are fixed by Act of Parliament, and which is subject to the supervision and control of the Privy Council. The Privy Council retains the power of itself fulfilling every one of the Council's functions should it in any respect make default, either by excess or defect. It may indeed be regarded as a sub-department of the Privy Council, whose proceedings are regularly submitted to the Lord President, for his tacit approval, or for his official intervention, as the case may be.

"And the declared purpose of the Legislature in establishing this sub-department is significant. The purpose is wholly that of the public interest and convenience. Before 1858, and since, any one can practise medicine and surgery in this country, however ignorant or untrained he may be. He does so at his own peril, not to speak of the peril of his patients. Before 1858, however, the public had no authoritative information regarding his qualifications. He might be all that he said he was, as regards training and skill, or again he might not, in which case he was probably the more vocal of the two in proclaiming and advertising his own qualifications. The State, after long debate, resolved that it was expedient to help the hapless public to discriminate between the 'qualified' practitioner, and the 'unqualified,' by setting up an official Register of the 'qualified,' which all might consult. If a member of the public desired to consult an 'unqualified' practitioner, he was still free to do so. He could ascertain that he was 'unqualified' by the fact that he was not on the Register.

"That then was the primary purpose of the Medical Acts, nothing more and nothing less. All the rest was machinery subservient to the primary purpose. The Council was appointed to make and maintain the Register of the 'qualified,' for the information of the public. It was in consequence charged with the duty of seeing that no one gained admission to the Register



whose qualifications were insufficient—and so perforce it had to supervise the professional training and testing of persons claiming to be 'qualified.' It became accordingly a Council of Medical Education. It was also charged with the correlative duty of seeing that no one who by his own default or misfeasance had forfeited his title to the privilege of registration, i.e., of inclusion in the list of the 'qualified,' should remain on the Register. And so the Council inevitably became a Tribunal of Discipline—empowered by law to hear and determine charges of misconduct grave enough to justify erasure from the Register. Its development into a domestic forum presents many points of interest to the student of jurisprudence. Its methods and procedure, its special jurisdiction, and its powers and functions, are not expressly laid down and defined in any enactment. They have grown out of successive judicial 'interpretations,' of the statutory words 'inquiry,' 'judgment,' and 'guilt,' applied to its disciplinary function in the Act. These interpretations have been given by Judges of the High Courts on occasions, when during its early stages the action of the Council was called in question, and together, by the same process as that which has created and still creates the Common Law of the Realm, they constitute the code which the Council is now called on to administer. Referring to the words I have cited from the Statute, Lord Justice Fry affirmed that those words 'express and are relevant to a proper form of judicial proceedings, and therefore though this body proceeds by different rules of evidence from those on which Courts of Law proceed, I cannot for a moment doubt that the Council (in the case before me) were proceeding judicially; nor can I help adding that the manner in which the Council has proceeded on this inquiry, as on all other inquiries, shows that the Council are fully aware that they are performing judicial duties, and endeavour evidently to perform them in a very admirable manner.' The Lord Chief Justice and his colleagues of the Queen's Bench, in another judgment, categorically stated that, in matters of professional misconduct deserving erasure, 'the Council is the tribunal to whom the Legislature has left the decision, as being the best judges in the matter, and this Court cannot interfere.' In another appeal Lord Justice Bowen stated that, provided 'due inquiry' had been made by the Council, 'the jurisdiction of the domestic tribunal, which has been clothed by the Legislature with the duty of discipline in respect of a great profession, must be left untouched by Courts of Law.' And finally, in 1893, the meaning and scope of the statutory verdict of the Council, the only one it is empowered to deliver, however old-fashioned it may seem to be if regarded otherwise than as a technical legal expression, namely 'guilty of infamous conduct in a professional respect,' which in practice is equivalent to 'guilty of conduct which renders the accused person unworthy to remain on the Register,' were laid down by the Court of Appeal in these memorable words:

"If it is shown that a medical man, in the pursuit of his profession, has done something with regard to it which would be reasonably regarded as disgraceful or dishonourable by his professional brethren of good repute and competency, then it is open to the Council to say that he has been guilty of infamous conduct in a professional respect."

"These are the bases on which the Council has grown from a mere Council of Registration into a Court of Medical Conduct. I have referred to them at some length because among the company which has just drunk to its well-being there are ornaments of the bench and the bar who may well be interested in the evolution of a tribunal, whose necessity was merely recognised and adumbrated by the Legislature, but whose functions, limits, and powers have been defined and elaborated by the Judicature. As Sir Henry Maine said: 'We in England (he might have added in Scotland) are well accustomed to the extension, modification, and improvement of law by a machinery which, in theory, is incapable of altering one jot or one line of existing jurisprudence. The process by which this

virtual legislation is effected is not so much insensible as unacknowledged. We do not admit that tribunals legislate; we imply that they have never legislated, and yet we maintain that the rules of the English Common Law.....are co-extensive with the complicated interests of modern society.'

"And though Scottish Law rightly claims an origin and a development independent of English Law, I venture to think that in this Metropolitan centre of judicial and forensic luminaries, some professional and scientific interest will be sympathetically extended to the creation and growth of a judicial body like the Council, which without the attributes and powers of a Court of Law, endeavours faithfully to function as a Court of Justice. I fancy that examples are not lacking in Scotland of similar bodies elaborated if not created by a process of 'non-legislative' judicial 'interpretation,' and the rest of the Company, layman and doctors, may not find it unprofitable to be reminded for a few minutes of the nature of the tribunal to which, as members of the public or of the medical profession, they have access, and of the limits within which they may approach it to seek redress of grievance.

"One such limitation I take the opportunity of mentioning, for a practical purpose. Scarcely a week passes but some indignant layman or doctor writes to me as President, saying, 'Why doesn't the Council interfere to stop my neighbour So-and-so, or the eminent Such-and-such, flagrantly transgressing the rules of the profession (not specified)? To my own knowledge he habitually offends, and if you put on a detective you will discover that I am right. I insist on you taking action. But my name must not be mentioned; I decline to produce evidence or to appear at your inquiry; but it is a public scandal that the Council should allow such things to go on,' etc., etc.

"I am perforce obliged to reply that the Council being a tribunal must proceed judicially; that it cannot employ detectives or spies; that it is by its nature precluded from itself prosecuting an accused person before itself as a Court; but that if a formal complaint is brought before it by a responsible person, accompanied by *bona fide* and *prima facie* evidence of the facts alleged, then an inquiry will be held in judicial fashion into the truth of the charge which is made.

"So careful indeed has the Council to be in this matter of freedom from bias against the accused practitioner that the Courts have indicated to it that even simple membership of a lawful prosecuting or defence Society, though innocent of any participation in its executive activities in a particular case, would disqualify a member of the Council from taking part in the hearing and determination of the charge. Constructively the member would be held to be a prosecutor, and justice and law alike decree that he must not also be a judge. If therefore the public or the profession are impatient with the Council in respect of its inaction regarding special breaches of good conduct, let them remember that it is theirs to bring and substantiate charges before the Council. If and when they do, then and not till then will the Council exercise its judicial function, declare its verdict on the facts proved to its satisfaction, and pronounce judgment thereupon."

"I have for forty years watched the Council's evolution both as a Board of Professional Education and as a Court of Professional Discipline. Its labours have been shared with successive generations of eminent, able, and upright colleagues; its composition has been varied from time to time by the accidents of life and by positive enactment. But it has never been wanting in a full supply of the 'professional brethren of good repute and competency' to whose judgment and capacity the Legislature and the Court of Appeal have agreed to entrust its responsible functions. During twenty-five years I have been President and from the President's chair have observed the steady growth of the Council in experience, in capacity for high affairs, and in harmonious and loyal co-operation towards the efficient discharge of its great responsibilities to the public, and to medicine as a profession."

## The Therapeutic Uses of Luminal.

By W. RUSSELL BRAIN, D.M. (Oxf.), M.R.C.P. (Lond.).  
(Abstracted from *The Lancet*, Vol. CCXVII, No. 5539,  
October 26th, 1929, p. 867.)

LUMINAL is a drug of comparatively recent introduction, and is especially valuable in the treatment of epilepsy. To obtain the best results, however, it must be rightly used, and its injudicious employment in epilepsy is attended by risks which may be serious. First, then, I want to define its use in epilepsy. Secondly, luminal has proved a valuable drug in the treatment of a number of other disorders, all of them common ones, and, therefore, it has a wide sphere of usefulness in general practice.

### Pharmacology.

Luminal, or phenobarbital, is a derivative of veronal, obtained by substituting a phenyl for an ethyl radical. Luminal itself is practically insoluble in water, but the sodium salt, luminal sodium, is readily soluble. For a mixture it is necessary therefore to use luminal sodium, which is incompatible with ammonium salts, and hence with ammonium bromide, and also with acids. It is important that a solution of luminal sodium should be as fresh as possible, as the drug deteriorates in solution, and I have frequently noticed that hospital patients who attend for medicine only once in three weeks or a month have most of their attacks a day or two before their visit, by which time their luminal sodium solution obtained at the previous visit has deteriorated.

Luminal sodium, being readily soluble, can be given subcutaneously or intramuscularly in 20 per cent. solution. I shall discuss doses later, but as a maximum it is doubtful whether grs. 5 or 6 can safely be exceeded as a single dose by the mouth, and I have never found so large a dose necessary. Luminal sodium is slightly less potent than luminal.

The ill-effects of luminal fall into two groups, rashes and neurotoxic phenomena. (1) Rashes are probably due to idiosyncrasy, as they are rare and may occur with small doses. They may be erythematous resembling scarlatina, papular resembling urticaria or measles, or combine both forms. The commonest site is upon the arms. (2) Symptoms of poisoning with luminal are those common to sedative drugs. In mild cases headache, vertigo, lethargy, and impotence occur, while more severe cases are characterised by ataxia, mental confusion, circulatory failure, and coma.

### Luminal in the Treatment of Epilepsy.

What can we expect from the use of luminal in epilepsy? Taylor Fox has recorded the effects of treatment of 167 epileptics with luminal. He found that 30 per cent. showed permanent benefit, 31 per cent. temporary benefit, 33 per cent. were unchanged, and 6 per cent. were made worse. Included in the 30 per cent. showing permanent benefit were 5 per cent. who were completely freed from fits, probably permanently. Major attacks respond to luminal better than petit mal.

On the debit side the most important fact relates to withdrawing the drug. In about 50 per cent. of cases it was found that after being treated with luminal for a limited period the patients actually had more fits after the drug was stopped than before it was begun, and there is a risk that status epilepticus may supervene if luminal be suddenly withdrawn.

I would suggest the following rules for the use of luminal in epilepsy:—

(1) Begin treatment with bromide alone, and only add luminal when the fits are not controlled by grs. 30 of bromide a day.

(2) In this event give luminal, in addition to bromide, beginning with gr.  $\frac{1}{2}$  night and morning, and increasing up to grs. 3 a day.

(3) If preferred, the same doses of luminal sodium can be combined with bromide in the mixture. In this

case the mixture should be freshly made, preferably once a week.

(4) When the fits are nocturnal the main, or even the only, dose, should be given at night—e.g., grs. 1 to 2—and when the fits are diurnal, in the morning as soon as the patient awakens.

(5) When the fits occur at regular intervals—e.g., at one stage of the menstrual cycle—it is still necessary to give luminal throughout the month, as otherwise the fit may be merely postponed a few days.

(6) If luminal is to be withdrawn, increase the dose of bromide; and warn the patient at the beginning of the treatment against stopping the drug without advice.

(7) Perseverance and regularity are the twin watchwords in the treatment of epilepsy. I tell my patients when they begin treatment that they may require medicine in some form until they have been free from fits for three years. Relapses and failures to respond to treatment are often due to irregular dosage or to suspending treatment when the patient has been free from attacks for a few weeks. If all patients were treated thoroughly from the very beginning, I am confident that the results of treatment would be very much better than they are.

(8) Status epilepticus may be treated by 2-gr. doses of luminal sodium in 20 per cent. solution subcutaneously.

Convulsions of organic origin—for example, those due to intracranial tumour or cerebral arterio-sclerosis—respond to luminal as well as idiopathic epilepsy.

### Other Uses of Luminal.

(1) *Migraine*.—The pathogenesis of migraine remains a mystery, but we can usefully recognise three factors concerned in the precipitation of the attack. The influence of diet indicates that a metabolic disturbance may play a part. F. G. Crookshank has emphasised the psychological factor, and pointed out that migraine commonly occurs in the highly conscientious introvert, who experiences great chagrin when he fails to attain to the high standard which he imposes upon himself. Probably it is the metabolic concomitants of this state of anxiety which render its possessors liable to migraine. Lastly, migraine is the outcome of a cerebral disturbance, the nature of which is obscure, but which is probably vasomotor in origin.

In treating migraine we may endeavour to deal with the metabolic factor by advising the patient to avoid articles of food which precipitate attacks, especially eggs, cream, chocolate, raw apples, and some forms of alcohol, and to take regular meals. Treating the patient's temperament is considerably more difficult, but we can point out to him the source of his mental stress, and restrain him from pursuing sport at the week-ends with the same ruthlessness with which he devotes himself to work. If, however, we can eliminate the cerebral response to these abnormalities, we may hope to abolish the attacks. It seems probable that this is the mode of action of luminal and the reason for its effectiveness in the treatment of migraine. It is usually sufficient to give  $\frac{1}{2}$ -gr. doses night and morning for a few weeks, and then continue for a time the nocturnal dose. Very few patients fail to respond with a marked reduction of attacks, and many become almost completely free from headaches.

(2) *Insomnia*.—Luminal is an excellent soporific, and the small dosage required is a convenience; gr. 1 to grs. 1 $\frac{1}{2}$  at bedtime are sufficient in most cases of insomnia to procure a good night's rest, and few patients complain of dullness the next day. Not all types of insomnia respond equally well to the same sedative. I have found luminal especially useful in two types of cases: (1) depressed patients, and (2) patients with organic disease—for example, high blood pressure.

Insomnia is an important feature of the clinical picture in mild cases of the depressive psychosis, of which every practitioner meets a large number, and which are not always accurately differentiated from neurosis. The characteristic triad of symptoms of which these patients complain is depression, loss of appetite,

and insomnia. Mental retardation may be experienced, and often presents itself to the patient as a feeling that "the brain won't work," but in mild cases hallucinations and delusions are exceptional. There is often a history of previous attacks, followed by complete recovery, and sometimes a family history of more serious mental trouble. The relief of the insomnia is an important part of the treatment. Luminal is also effective in the treatment of insomnia associated with mental excitement, but larger doses, up to grs. 5, may then be required.

It is rash to say of any drug that it never gives rise to addiction, but it is very exceptional for luminal to do so. The risk of habit formation may be diminished in the neurotic patient with insomnia by letting him put the tablet by his bedside and take it only if he is not asleep half an hour after going to bed. After he has secured a few nights' sleep by means of the drug he will often fall asleep without its aid if he feels that it is readily available.

(3) Aural vertigo is a complex subject, upon which I can only touch lightly now. It is convenient to distinguish clinically two types of aural vertigo: (a) An acute type associated with an acute lesion of the internal ear, an acute labyrinthitis, sometimes secondary to middle-ear infection, acute or chronic, sometimes of undiscovered aetiology. (b) The second and commoner type is found in the patient who suffers from recurrent attacks of vertigo of varying severity associated usually with deafness and tinnitus. This is a heterogeneous group. Most cases have not had purulent otitis media, but the condition is usually secondary to blockage of the Eustachian canal, with deflected nasal septum, polypus, infected air sinuses, chronic catarrh, or dental infections.

In this second group luminal is an exceedingly valuable drug. I cannot remember a patient who was not greatly relieved by it, and in mild cases complete freedom from vertigo is often produced in a few days. I give  $\frac{1}{2}$ -gr. doses three times a day at first, and later reduce the dose. Luminal, of course, does not remove the cause of the vertigo, which must be sought and treated by otological methods.

Luminal is an excellent vestibular sedative in conditions of acute labyrinthitis, and I have used it also for vertigo due to lesions of the vestibular tracts and centres—for example, in encephalitis lethargica and disseminated sclerosis. It is useful as a preventive of sea-sickness.

(4) *Pruritus*.—I owe my acquaintance with the antipruritic effects of luminal to Dr. W. J. O'Donovan. It is especially valuable in cutaneous affections in which a large neurotic factor plays a part, such as pruritus ani. Used in gr.  $\frac{1}{2}$  doses and combined with appropriate local treatment it greatly diminishes the pruritus and so helps to break the vicious circle in which scratching keeps up an abnormal and irritating state of the skin.

(5) *Miscellaneous Disorders*.—Luminal is also useful as a sedative in chorea, whooping-cough, and exophthalmic goitre, and other uses for it will, no doubt, suggest themselves.

## The Treatment of Influenza with S. U. P. 36.

By R. M. PEARCE, M.B., Ch.B.

(Abstracted from *The British Med. Journ.*, October 12th, 1929, p. 663.)

THE drug S. U. P. 36 is a symmetrical urea, and its full chemical name is para-benzoyl-para-amino-benzoyl-amino-naphthol 3 : 6 sodium sulphónate.

During the influenza epidemic in the spring of the present year I endeavoured to make a systematic test of the advantages of treating influenza by intramuscular injections of this drug. Every case of influenza seen, in which the disease had not existed for more than forty-eight hours, was used for my records, alternate cases being treated by injection of S. U. P. 36 and the remaining cases orally by drugs such as salicylates, aspirin, and influenza mixtures. Cases not first seen until more

than forty-eight hours after the onset of the disease were not taken into account, as it was not expected that the injection of S. U. P. 36 could be of much use after the acute phase had passed.

The method employed in the injected cases was to inject as early as possible an initial dose of 0.5 c.cm. (representing 0.005 gram). This was followed by an injection of 0.75 c.cm. on the fourth day following the initial dose if the case had not cleared up in the meantime. In some cases the initial dose given was 0.75 c.cm. The injections were usually made into the gluteus medius muscle, and only very trivial complaints of pain were ever received. Occasionally the injections were made into the deltoid muscles, where in one or two cases rather more pain was suffered. The only drugs given orally to any of the patients treated with S. U. P. 36 were calomel, 2 to 5 grains, where indicated—that is, in roughly half the injected patients—and the use of a simple expectorant mixture where necessary (in only about 10 per cent. of the injected patients). In no other injected patients, excepting the two noted with cardiac trouble, were any other drugs given.

At the end of a fortnight it became quite evident to me that the injected patients had the advantage over the non-injected ones, and thereafter I treated by injection all patients who would submit to the treatment.

The epidemic of influenza prevailing was of the somewhat mild type. The onset was very acute, with a sudden rise of temperature to  $101^{\circ}$  to  $103^{\circ}$ , with pain in the limbs and back, fairly severe headache, and in many cases a particularly troublesome cough with little expectoration. Pulmonary complications were rare and the mortality was low, no death being recorded among the series of cases investigated.

It was found to be difficult in practice to collect data which would be of value for tabulation in a comparative manner between injected and non-injected cases, but, taking five headings as the main symptoms in the disease, comparison may be drawn in the following manner:

	Control cases.	Injected cases.
Average duration of pyrexia in days ..	2.8	1.4
Average duration of headache in days ..	2.1	1.0
Average duration of muscular pain in days ..	3.4	1.3
Average number of days in bed ..	5.7	2.8
Average number of days off work ..	16.0	6.9

At first sight it may appear that these comparisons are subject to many fallacies and therefore not of much value, but, taking into consideration the following points, I think, though the numbers are small, that the five comparisons drawn give a fairly accurate idea of the progress of the attack.

From a comparison of these figures it will be seen that in the injected group the duration of pyrexia and headache is halved, while the duration of muscular pain is even more than halved. The time in bed is also halved, but this is perhaps the least reliable of the figures for comparison. The figure for the average time off work may, I think, be taken as reliable, and is again seen to be slightly more than halved in the injected cases.

A careful study of the injected cases reveals the fact that the earlier the injection is given the greater is the benefit derived, and this was even more obvious from the clinical study of the cases themselves. As a matter of interest, several patients seen too late to be included in the comparative records were given their initial dose on the third, fourth, and in one instance on the fifth day of the disease, and in none of these cases was any benefit noticed from the injection. This fact is noteworthy, as it may be of importance in determining how the beneficial effect of the injection of such drugs as S. U. P. 36 is brought about, and is a point which warrants further investigation. One very interesting clinical phenomenon observed after injection was the almost entire absence of perspiration during the period of the abatement of pyrexia. So noticeable was this

that in many cases my attention was drawn to the dryness of the patient's skin by other members of the family, and in several cases of pneumonia which I have treated with S. U. P. 36 the same absence of perspiration has been noticed by nurses in attendance.

It is important to emphasize here that all the cases injected were definitely influenza, showing the clinical symptoms already described, and that no cases of "severe colds" were included. The injected cases, as a matter of fact, were mostly of a rather more severe nature than those not injected.

#### Summary and Conclusions.

(1) That the injection of S. U. P. 36 should be made at the earliest possible moment when once symptoms point definitely to influenza.

(2) That in the early uncomplicated case the initial dose should be 0.5 c.cm.

(3) That in severe early cases, cases of more than twelve hours' standing, and cases presenting such complications as tonsillitis or bronchitis, the initial dose should be 0.75 c.cm.

(4) That these doses need only be repeated on the fourth day after the initial dose if symptoms have persisted until that time, and that there is no advantage whatever in repeating the injection when symptoms have subsided.

(5) That although the gluteus medius muscle is the site of choice, the injections can quite well be made in other muscles. This is a very much more important matter in general practice than might be supposed, especially in view of the importance of making the injection "then and there" at the earliest possible moment.

(6) That the early initial dose completely aborts the attack in nearly every case, and that therefore if the treatment be used in influenza epidemics on a wholesale scale and early enough it is the most valuable agent that we at present have discovered for combating these epidemics.

(7) That treatment administered at later stages, providing that the attack has not existed for more than forty-eight hours, considerably shortens the duration of the disease.

(8) That although my present series of cases is too small to show whether the liability to complications is reduced, I certainly think that this will be proved to be the case.

### Typhoid Fever in Children.

By L. J. HALPERN.

(Abstracted from *International Medical Digest*, Vol. XV, No. 3, September, 1929, p. 176.)

In a study of 67 children ill with typhoid fever, who ranged in age from 10 months to 12 years, the following observations appear noteworthy:

(1) The onset was relatively abrupt in almost one-half of the cases.

(2) Abdominal pain was a frequent initial complaint and, because of its location at times in the right lower quadrant and sudden onset with vomiting, it occasionally made difficult the exclusion of acute appendicitis.

(3) Signs of meningeal irritation were relatively frequent, and often the disease with this complication simulated the picture of a true primary meningitis.

(4) The pulse rate was rapid and in proportion to the degree of fever in one-fourth of the cases.

(5) The blood in 6 per cent. of the cases revealed a leucocytosis in the absence of complications, instead of the usual leucopenia.

(6) Positive Widal reactions out-numbered the positive blood cultures obtained, and both were more frequently obtained during the second week of illness.

(7) The stools yielded a higher percentage of positive cultures than the urine.

(8) Complications were largely suppurative processes.

(9) Death occurred most often in the second week of illness. Signs of meningeal involvement frequently preceded death.

## Reviews.

**THE MEDICAL ANNUAL, 1930.** Pp. c plus 652 plus 167. Profusely illustrated, and with 61 plates, plain and coloured. Bristol: John Wright & Sons, Ltd. Price, 20s. plus postage.

It is the medical man—whether general practitioner, consultant, or specialist—were limited to the purchase of only one book annually, we feel certain that his choice would be the *Medical Annual*. Every year this notable and important work grows in interest and authority; the different sections are written by the leading authorities on these subjects in the United Kingdom and elsewhere; the subject matter is concisely presented, but with a wealth of illustrations, admirably executed; the volume is essentially one for the family doctor, to keep him abreast of new developments in medicine, surgery, and specialised subjects.

The 1930 volume is remarkable for several special articles. Dr. W. R. Campbell of Toronto contributes a review of the whole subject of diabetes, dealing with the historical aspect of insulin, the pathology of diabetes, diabetes in children and in pregnancy, insulin therapy, and surgery in the diabetic. Professors Leriche and Fontaine of Strasbourg University deal with the surgery of the blood vessels, and discuss the many conditions which may be relieved by peri-arterial sympathectomy. Mr. Thurstan Holland contributes an article on radiotherapy, and in many of the sections dealing with malignant disease the remarkable results achieved by radiotherapy in recent years are discussed; thus the radium "bomb" for distance therapy as used at Westminster Hospital is described and illustrated; the distribution of radium needles in cancer of the breast; and also the use of lead selenide, now issued as "D 4 S" by the British Drug Houses, Ltd. Results in treatment of cancer of the tongue and larynx are now better with radium therapy than with operation. Sir Robert Stanton Woods of the London Hospital deals exhaustively with light therapy in all its aspects. The article on nephritis by Dr. Geoffrey Hadfield is important for its detailed study of the pathology of the condition, and its admirable illustrations. The article on anaesthesia by Dr. Blomfield of St. George's Hospital deals fully with the use of preliminary analgesics before administration of the anaesthetic proper, with avertin narcosis, intravenous anaesthesia, post-operative acidosis, ethyl chloride as used for prolonged operations, and much other recent work. Pulmonary diseases now afford a meeting ground for the physician and the surgeon, and recent operative procedures are discussed and described. Under the heading angina pectoris Dr. A. G. Gibson of Oxford University summarises much recent study of coronary thrombosis, a condition which it is now realised may be an important one. Dr. Rendle Short deals with the ever-increasing literature on gastric ulcer, and Dr. Robert Hutchison with duodenal ulcer; on the continent these conditions appear to be dealt with as a rule by surgery, in Great Britain there is to-day a tendency rather to try medicinal measures.

One of the most important surgical articles is that on the treatment of burns by the tannic acid spray by Sir W. I. de C. Wheeler, F.R.C.S.I., where the detailed technique of the method is given. The same author also has an important article on the technique of skin grafting. The method of putting up a case of crushed fracture of the spine by hyperextension with a double plaster cast is fully illustrated in four figures. Another important surgical article is one on fissure of the anus by Mr. Lockhart-Mummery.

The sections dealing with eye diseases are by Lieut.-Col. A. E. J. Lister, F.R.C.S. (retd.), and those on tropical

diseases by Sir Leonard Rogers. Dr. J. D. Rolleston deals with acute infectious diseases. We need only mention these three names to show the importance of these sections.

We would urge every general practitioner in India to buy this volume, for he will find it invaluable.

**DISEASES TRANSMITTED FROM ANIMALS TO MAN.**—By T. G. Hull, Chief Bacteriologist, Illinois Department of Public Health. Pp. XI plus 350, with 29 text figures. 1930. London: Baillière, Tindall & Cox. Price, 25s.

This is a most interesting and timely publication. For it gathers together into brief compass the essential knowledge with regard to the diseases transmissible from animals to man that has resulted from the labour of scores of pioneers in research work during the present century. The information here collected into small compass had previously been scattered through a wide diversity of textbooks and journals, and both medical men and veterinarians alike will appreciate the value of this handbook.

In a way it is rather disappointing that the author adopts the catalogue rather than the essay style, for in his concluding section he just glances at a most fascinating line of argument. Civilised man of to-day has gathered around him a collection of domesticated animals which are the descendants of wild strains; the placid cow of to-day had wild cattle for its ancestry, the horse has been domesticated since at least 2000 B.C. and probably earlier, swine were first domesticated in China about 2900 B.C., the dog is cousin to the wolf, whilst the rat—originating in Asia—has followed man and his food supplies into every part of the world. And as man became more civilised and his animals more domesticated, the association of man and animals became more close, and with this the increasing transmission of diseases from animals to man, and even vice versa. This thesis is a most interesting one, for it is obvious that such an evolutionary process is probably not now ended, and the present world-wide outbreak of psittacosis shows what future possibilities may be in store. Hence the importance of a close liaison between medicine and veterinary science, and the special value of this book at the present juncture.

Turning to a more general survey of the book, tuberculosis is the first disease dealt with, and here there is a wealth of information for the medical man, the public health worker, and the veterinarian. Special features of the book are the useful summaries at the end of each chapter, and the selected brief bibliographies on each subject. Man is moderately susceptible to the bovine type of infection, but fortunately but very slightly susceptible to avian tuberculosis; hogs are susceptible to all three strains, and immunization of calves by vaccination with living avirulent organisms (B. C. G.) has not given encouraging results in the United States and Canada.

Anthrax was known to the Pharaohs. No measure save the destruction of infected animals is of any value, but the shaving brush has practically ceased to be a menace in countries where special regulations are in force. Foot and mouth disease is adequately described; it is chiefly transmissible to children. The *abortus-melitensis* group of organisms is fully dealt with; the caprine strain has developed virulent properties for man, the bovine strain rarely affects man, but the porcine strain is extremely virulent for man. In this chapter we have a brief but extremely useful summary of this world-wide problem. Milk sickness, due to poisoning by trematol, a complex alcohol found in the white snake root and the rayless golden rod, is a disease rarely transmitted to man by cattle. Actinomycosis is essentially a rural disease.

Smallpox and cowpox are next briefly reviewed. The figures for vaccination in the United States are very striking; in States where vaccination is compulsory for school attendance the case incidence was 9.5 per 100,000 population; in States where it is prohibited or restricted the incidence was 102 per 100,000 population.

Glanders often affects veterinary workers. With regard to rabies a useful summary of the present position with regard to different countries in the world is given. Here the two illustrations of ineffective and effective types of muzzles are useful. It is a pity, however, that the author has apparently not had access to the rabies literature in India, for he barely mentions Semple's carbolic vaccine, takes most of his statistics from European institutes, and omits any mention of the work of Acton and Harvey on the Negri body. The chapter on psittacosis will have to be modified in a future edition in view of recent research work on the disease. On the other hand the chapter on food poisoning is of special value, for it gathers together a mass of useful information culled from a wide series of sources, with a useful bibliography. Animal parasites—all of them helminths—are then dealt with.

In the second section of the book diseases of rodents are dealt with. Plague is well dealt with, but again recent work in India is omitted. (The book indeed is largely written from the American standpoint, as was inevitable; thus the ground squirrel of California receives rather more attention than it perhaps deserves.) Tularemia is dealt with in full detail, as might be expected from an American author. In connection with spirochaetal jaundice, we doubt whether the statement that spirochaetal jaundice is a new disease dating from 1916, is correct; what was almost certainly the same disease was prevalent in Napoleon's army in Egypt in 1800, and also in the American Civil War; recent work also goes to show that rats, dogs, and man are alike infected from bathing in infected waters rather than from each other. In the brief section on rat-bite fever the Indian work on this disease is completely neglected, whilst the micro-organism responsible is termed *Spirochaeta morsus muris* instead of *Spirillum minus*, as it should be; Robertson's important monograph of 1924 has also apparently not been consulted.

Other diseases dealt with are Rocky Mountain spotted fever—and, with regard to animals as passive carriers of disease organisms—botulism, tetanus, and gas gangrene. The section on what are essentially human diseases which may be transmitted to animals includes much collected information on the milk transmission of septic sore throat, on animals susceptible to diphtheria and scarlet fever; whilst the most useful chapter in the book is a review of the rôle played by different types of animals in the spread of diseases, in which each species of animal is considered in turn. This is the most original section of the book. There are good indexes of authors and subjects.

Dr. Hull's book, we believe, will appeal to a very wide circle of readers. A copy of it should certainly be in every medical and veterinary library in India. On the other hand one cannot help feeling that the book is too parochial in its outlook. The protozoa are almost completely neglected; for example, the tremendously important problem of the possible relationship of sleeping sickness of man to *Trypanosoma brucei* infection of wild game in Africa is not mentioned. The literature quoted is mostly from American (and sometimes continental) sources. We regard Dr. Hull's book as a most praiseworthy attempt, and a most useful volume, both to read and for purposes of reference; but, if, as we hope, a second edition is called for, we would suggest that he should collaborate with a second author with tropical experience. There is badly needed a rather more comprehensive work dealing with this subject, and including more parasitology than the present volume contains.

R. K.

**A TREATISE ON MATERIA MEDICA AND THERAPEUTICS.**—By B. N. Ghosh, F.R.F.P. & S. (Glas.). Twelfth edition, 1930. Pp. XII plus 763. Calcutta: Hilton & Co. Price, Rs. 7-8-0. London Agents: H. K. Lewis & Co. Price, 12s. 6d.

It is scarcely necessary for us to bring this well known book in its new edition to the notice of our readers.



For many years it has been a favourite textbook both with medical students and practitioners in India; in brief it may be termed the "Hale White" of India, though it contains far more information than the well known British handbook. The first edition was published in 1901 by the late Rakhaldas Ghosh, since when it has had several different editors—the late Sir Pardey Lukis, I.M.S., Col. J. T. Calvert, I.M.S., General B. H. Deare, I.M.S., and since 1915 Dr. Birendra Nath Ghosh, formerly Professor of Pharmacology, Carmichael Medical College, Calcutta. Twelve editions in twenty-nine years is a sufficient tribute to the value of a textbook published in India.

The volume is divided into eight parts, and covers an extremely wide scope. Part I is devoted to materia medica proper; Part II to pharmacy and dispensing; Part III to the administration of drugs, including posology; Part IV to pharmacology; Part V to materia medica and therapeutics; Part VI to vaccines and serum therapeutics; Part VII to organo-therapy; and Part VIII to radiation therapy. There is a good index.

In the present edition the entire text has been carefully revised, many portions have been re-written, and almost every drug has received attention in the light of recent research. Much of the redundant matter has been deleted and, what is of special value, a large number of non-official preparations of doubtful value have been deleted to make room for more recent and useful drugs. The new drugs introduced into the 12th edition are sodium sulphocyanate, sodium thio-sulphate, sancorysin, novasurol, trypanamide, stovarsol, acetylarsan, butyn, borocaine, ephedrine hydrochloride, sodium tetraiodophenolphthalein, plasmochin, quinine urethane, cardiazol, kurchi bark, and others. The section on light therapy has been entirely re-written.

We have no doubt that this most useful and popular book will continue to be a favourite with medical students and practitioners in India. It only remains to add that the style of printing and publication is exceptionally good for a work published in India.

**RICKETS, INCLUDING OSTEOMALACIA AND TETANY.**—By Alfred F. Hess, M.D. London: Henry Kimpton. 1930. Pp. XV plus 425. Illustrated with 52 engravings. Price, 25s. net.

AMONG physicians, health officials and laymen, the question of rickets is daily becoming a matter of widespread interest and the publication of a really comprehensive treatise on this subject will be of great help to them. Professor Hess has produced this volume after laborious work extending over five years and we have no doubt that the book will greatly interest the profession.

The book opens with a historical survey of the disease and in this chapter the author traces the evidence of its existence from the period of the earliest civilization down to the present day. In his survey mention is made of some of the earliest writers and their works and the author has spared no pains in doing justice to all the different contributions. Regarding the geographical distribution of this disease the author meets with some difficulty, for even in modern times the information concerning rickets in various parts of the world is insufficient and sometimes conflicting. From a general review of the question the author concludes that in general a map of incidence of rickets is the practical equivalent of a map of deficiency of sunlight.

In one of the most attractive chapters of the book the etiological factors are fully discussed. Professor Hess believes that heredity may play a rôle in races and individuals, but is a minor factor of no material importance. The rôle of diets in the etiology of rickets is important but is imperfectly understood, and the rôle of hygienic factors has been far too greatly stressed by certain schools of thought. The pathological anatomy of rickets is thoroughly dealt with in a separate chapter and many beautiful figures are given to illustrate the pathological changes that are produced.

The chapters on osteomalacia and tetany deal with the clinical features and biological characteristics of

these conditions in their relationship to the rickets. Dealing with the treatment of these various disorders, the author lays particular stress on cod-liver oil, ergosterol and ultra-violet irradiations. At the end of the work there is a comprehensive bibliography.

The book is a valuable contribution to medical literature and the well balanced and impartial manner with which the author tries to deal with the different controversial views is one of its characteristic features. The book will be of great help to all those who are interested in the problem of deficiency diseases.

R. N. C.

**THE FEMALE SEX HORMONE.**—By Robert T. Frank, A.M., M.D., F.A.C.S. London: Baillière, Tindall and Cox. Pp. 321 with 86 text figures. Price, 25s. net.

THIS handy volume will undoubtedly make a strong appeal to all keen students of endocrinology. To research workers in the field it will prove of sterling worth as it gives in a concise and systematic way all the important phases of development of the subject together with the difficulties and pitfalls encountered by them. The subject is particularly difficult to deal with in view of the overwhelming amount of literature that has appeared and the enormous mass of conflicting evidence recorded from time to time. All credit must go to the author for having discharged his task so admirably.

The book is divided into two parts. The first part deals with the biology, pharmacology and chemistry of the subject. The anatomy of the genital tract and the cyclical changes in the breasts and other organs consequent on puberty and pregnancy are considered in detail. In two chapters, the physiological experiments conducted to determine the nature of the hormone responsible for "feminineness" are described. The chemical methods of extraction of the female sex hormone and its method of assay by the vaginal smear test, as developed by Allen and Doisy are also dealt with in separate chapters. Special stress is laid on the influence of the anterior lobe of the pituitary in relation to the functional activity of the ovaries. The onset of puberty has been demonstrated as an anterior pituitary effect which can be artificially produced by injection of anterior pituitary extract or successful implantation of fresh pituitary substance. The phenomenon of sex and reproduction has been ascribed to two different hormones—the general female sex hormone elaborated by the "gestational gland" (a compound gland of internal secretion consisting of the growing Graffian follicles, the corpus luteum and the placenta), and the more specific corpus luteum hormone whose activity is limited to embedding of the ovum and regulation of follicle growth.

The second part deals with clinical investigations of the female sex hormone based on blood tests that have been done from time to time amongst different types of cases. This chapter is full of interesting findings. It throws considerable light on many obscure and imperfectly understood phenomena in the sexual cycle of the female and will repay careful reading.

The bibliography appended at the end of each chapter is a feature of note. The illustrations and schematic diagrams are excellent. The binding and format are all that can be desired. The book is worthy of a place in the library of all medical institutions.

R. N. C.

**RADIUM AND CANCER (CURIETHERAPY).**—By Duncan C. L. Fitzwilliams, C.M.G., F.R.C.S. London: H. K. Lewis and Company Ltd. 1930. Pp. VIII plus 172. Illustrations: 8 plates (4 coloured) and 64 illustrations in the text. Price, 12s. 6d. net.

THIS little book is practically a compendium of the author's personal experiences and observations in the field of Curitherapy.

As he confesses himself, the results obtained at first were poor in the extreme. This was due to the limited



quantity of radium available, and the impossibility of one surgeon monopolising the lot for days at a time. When, however, he was able to supplement the hospital supplies from private sources his results were revolutionised and this book, after preliminary chapters on the history, character, and handling of radium, methods of use, effect of radium on the tissues, etc., is a record of the methods used in various forms of cancer and the results obtained.

There is a note of humility pervading the utterances of the author. No extravagant claims are made. All the latest methods are described, and the results in treated cases given without embellishment. The text is eminently readable, and the volume should form a valuable addition to the library of the specialist in radiotherapy, as well as to the general practitioner, who will be able to see for himself when and where radium treatment is indicated.

The print is clear and the text well illustrated. The publishers are to be congratulated on the "get up" of this volume, which should run to a second edition in a short time.

J. A. S.

**CLINICAL METHODS FOR STUDENTS IN TROPICAL MEDICINE.**—By Lieut.-Col. G. T. Birdwood, M.A., M.D., D.P.H., I.M.S. (retd.). Fourth Edition, 1930. Pp. 366. Calcutta: Thacker, Spink & Co. Price, Rs. 8-8-0.

THIS admirable little book is probably very well known to our readers. It contains an immense amount of clinical and laboratory information packed into small compass, and is an essential *vade-mecum* for both the medical practitioner and the medical student in the tropics. The contributors to the new edition include Major-General Megaw, D.G.I.M.S., Lieut.-Col. W. F. Harvey, I.M.S. (retd.), Col. S. R. Christophers, F.R.S., I.M.S., Lieut.-Col. H. W. Acton, I.M.S., Lieut.-Col. H. J. Walton, F.R.C.S., and Dr. H. B. Newham, Curator of the Museum of the London School of Hygiene and Tropical Medicine. Thus the volume, although small and compact, is representative of the highest opinions in tropical clinical medicine, and authoritative.

The book contains no less than 113 items, varying from details of blood examination for malaria and kala-azar to the identification of poisonous snakes, urinary and renal function tests, information with regard to rabies, the treatment of leprosy, and several sections on cholera. The sections on malaria have been re-written by Colonel Christophers, who also adds sections on the identification of Indian anophelines; this part of the book is of special value on account of its authoritative nature and the full details given, and the volume should be in the hands of every worker in malariology.

In the present edition several sections have been re-written. New sections have been added on the vitamins, the essentials of a good diet, the tests for renal efficiency, the Schick test, the different urinary tests in diabetes, and the causation and treatment of goitre. Dr. Newham deals with the preservation of pathological material, and the preservation of snakes, larvae, and worms.

It is impossible within the limits of a short note to review the very great amount of information of value which this small handbook contains. To many of our readers it will be an old friend, and they will welcome a new edition. Those who are not acquainted with the book would do well to purchase it; its especially Indian aspect further renders it of special value to clinicians in this country.

R. K.

**A SHORTER SURGERY: A PRACTICAL MANUAL FOR SENIOR STUDENTS.**—By R. J. McNeill Love, M.B., M.S. (Lond.), F.R.C.S. (Eng.). Second Edition. London: H. K. Lewis and Co. 1930. Pp. VIII plus 371. Illustrations 74 including 31 plates (1 coloured). Price, 16s. net.

MANY attempts have been made in the past to compress all the salient facts of surgery into one small

volume. The vast majority of these attempts have resulted in books that are difficult to read, or that consist of a mass of tabulated facts and lists which the student learns by heart. Mr. Love's book is not of this kind. It is eminently readable and yet contains all the essentials for the student.

It is not intended to replace the larger textbooks, for it would not be possible to discuss the controversial matters of surgery and the pathology of surgical conditions within three hundred and fifty pages.

It is concise and dogmatic, gives very practical information, whilst emphasis has been laid on those examination requisites that the student often lacks, such as classification and systematic methods of clinical examination. In this, the second edition, chapters have been introduced on specific diseases, fractures and dislocations. This must add to the value of the book. This *Shorter Surgery* will be of great value to the student who has completed his clinical training and who wishes rapidly to recapitulate the subject for his examination.

H. H.

**SURGICAL NURSING.**—By E. L. Ellason, A.B., M.D., Sc.D., F.A.C.S., L. K. Ferguson, A.B., M.D., and Elizabeth K. Lewis, R.N. London: J. B. Lippincott Company. 1929. Pp. XVI plus 566 with 261 illustrations. Price, 12s. 6d. net. Obtainable from Messrs. Butterworth and Co. (India) Ltd. Calcutta. Price, Rs. 9-6 net.

THE pre-operative treatment and the nursing that is carried out after the operation are matters of very great importance to the patient and the surgeon. The surgeon cannot watch all the details of this work himself, and in many cases he is not able to be certain that the instructions he has given have been carried out in the exact manner that he wished. He must depend upon the nurse, and he must know that not only is she reliable, but that she also has an accurate knowledge of the nursing procedures that he orders.

This book will help both surgeon and nurse for it is written by practical surgeons and a nursing sister of experience. The book is very complete; indeed it is difficult to discover any surgical technique which can legitimately come under the heading of nursing that is not described. The physiological and pathological facts that form the basis of the various forms of treatment are explained, and this leads to a logical understanding of the recommendations that are given. The chapter on operating room technique is perhaps the best. The instructions for the theatre nurse are simple and yet complete. Nothing is left out and the more important points receive the attention that they deserve.

There is very little to criticise. The description of Murphy's method of proctolysis is not that originally described by Murphy, and is a method that frequently fails in practice. The illustrations are numerous and good.

The reviewer has not seen any book that gives so complete an account of the nursing of surgical cases. It should be available in every operating theatre, and will be invaluable to all nurses who have much to do with the treatment of patients before and after operation.

H. H.

**THE PATHOLOGY OF THE EYE.**—By Jonas S. Friedenwald, M.D., F.A.C.S. London: Henry Kimpton. 1930. Pp. XX plus 346. Illustrated with 253 figures, mainly microphotographs. Price, 21s. net.

THIS book is the outcome of a course of lectures written for the instruction of medical students and house officers in the Department of Ophthalmology of Johns' Hopkins Medical School and contains fifteen chapters with an appendix on microscopical technique.

In the introduction, the anatomy and physiology of the eye are discussed, not in detail but only those facts concerning structure and formation which have a bearing

on the peculiar development of pathological processes.

The 2nd, 3rd and 4th chapters deal with inflammations involving the eyeball as a whole, with focal lesions and with specific diseases affecting the different parts of the eyeball. The author points out that the etiology of iritis, cyclitis and choroiditis still leave much in doubt and many cases of these conditions occur which cannot be accounted for by specific or focal infections. It is difficult to explain why organisms can attack the tissues of the eye and yet do no damage to the lungs through which they must first pass.

The fifth chapter is devoted to injuries of the eye. The chapter on cataract forms most interesting reading and the author advances the theory that senile cataract is due, in some forms at least, to the normal decrease in permeability of the lens capsule. Discussing glaucoma, the author favours the secretion theory of the formation of the intra-ocular fluids rather than by a process of dialysis, and is of opinion that acute glaucoma is the result of a local vaso-motor crisis, manifesting itself by a dilatation and an increased permeability of the capillaries of the ciliary body.

Chapter 8 deals with senile changes and arteriosclerosis, and in it the author states that venous sclerosis in the retina is common in contra-distinction to venous sclerosis in other organs where it is rare. This is due to an anatomical peculiarity of the retina caused by the actual encroachment of the thickened arterial and venous walls upon the common space within the common arteriovenous fibrous coat at the point of crossing.

Chapter 9 deals with choked disc and albuminuric retinitis. Oedema of the optic disc is discussed but the mechanism of the changes brought about still remains obscure.

Diseases of metabolism, of nutrition, and of the endocrine glands are discussed in chapter 10, and this section will be of interest to workers in India where diseases of the eye due to vitamin deficiency are so common.

Chapters 11 and 12 deal with diseases of the cornea, conjunctivitis, and ocular adnexa. The causation of trachoma is discussed but no definite causation is yet known. Noguchi has recently isolated an organism related to *Bartonella bacilliformis* with which it has been possible to infect monkeys and produce a disease not unlike trachoma. The evidence is suggestive but not conclusive.

Chapters are also devoted to congenital anomalies, hereditary diseases and tumours.

The book is a most excellent work, written in clear and simple style and is full of original observations and deductions. The illustrations are good, mainly microphotographs, and are numerous.

We cordially recommend this book to our readers; it will be found most useful and helpful to all who are interested in diseases of the eye.

E. O'G. K.

**BERGEY'S MANUAL OF DETERMINATIVE BACTERIOLOGY.**—By D. H. Bergey. London: Baillière, Tindall and Cox, 1930. Pp. XVII plus 589. Price, 27s. net.

THIS well-known manual is now in its third edition, and supplies a very long-felt want amongst bacteriologists. It is the only authoritative work on the subject which gives a description of the majority of the organisms known to this science. The book should be in every laboratory where cultural work is being undertaken for agriculture, hygiene or medicine. The present edition has been brought up to date, and several alterations have taken place in the nomenclature. The genus *Eberthella* has now been divided into two genera, i.e., the genus *Shigella* which includes the dysentery group, and the true *Eberthella*, the typhoid group. In the family *Mycobacteriaceae*, four new genera are described. There are several points in a book such as this which are open to criticism, for example the so-called *Micrococcus melitensis* and *B. abortus* (Bang) have been placed in the genus *Alkaligenes*, whereas they

are much more closely allied to the genus *Pasturella*. Again in many of the keys the organisms are divided not according to morphological characters, but upon their pathogenic or saprophytic habits. The cultural characters of the *Mycobacterium leprae* are given in detail, but it is still very doubtful whether this organism has ever been cultivated. We are inclined to think that too much stress has been laid on the behaviour of the growth of these organisms rather than on their morphological characters. Thus the genus *Actinomyces* is divided into four separate headings, viz., animal parasites, plant parasites, saprophytes, and thermophilic saprophytes, whilst secondary importance has been attached to the morphology of these parasites. Our experience leads us to believe that most of the so-called parasitic *Actinomyces* have a normal saprophytic existence in the soil, and only become parasitic when accidentally introduced into the tissues of man by trauma.

The order *Spirochaetaceae* has been divided into six genera, two of the genera contain organisms which are free living in water, namely, *Saprospira* and *Spirochaeta*. Four of them however are parasitic, namely *Cristispira* which is found in mussels, the genera *Borrelia* and *Treponema* in the blood in animals or man, and *Leptospira* in rodents and in man.

The book contains an enormous mass of information in the 561 pages of small print, and for each family, tribe and genera a key is given which makes it very helpful in identifying the particular bacteria concerned. As bacteriology is a comparatively young science every effort should be made to prevent confusion in the nomenclature such as has already occurred in some of the older sciences.

H. W. A.

**THE HEALTH GAME.**—By Dr. B. E. Washburn, M.A., M.D. London: J. & A. Churchill, 1930. Pp. XI plus 202, with 20 illustrations. Price, 5s. net.

THIS is a "breezy" book describing the methods of propaganda used in Jamaica. It does not go too deeply into physiology as the basis of hygiene, it states in plain language the main facts of health and disease, and the methods likely to be successful in getting this information "across" to the every-day layman. It will be found particularly useful to health teachers and workers who have to teach hygiene to school children, boy scouts and adult health classes. A story of rural life in Jamaica runs through the book, telling how the conservatism and opposition of the older people are conquered by the tact and persuasion of the District and the School Medical Officers and by the fact that the latter had won over the family to their side. There is nothing new in the scientific matter of the book; but the propagandist will obtain new ideas in methods and presentation. There is a very good description of a privy for houses in rural areas. A feature is the rhyming couplets attached to each chapter—these may be doggerel, but doggerel often sticks where stylish prose does not. Perhaps the truest couplet is this—"But if you'd teach the rules of health, you first should practise them yourself."

A. D. S.

**HYGIENE FOR NURSES.**—By John Guy, M.D., D.P.H. (Camb.), F.R.F.P. & S. (Glas.), F.R.C.P. (Edin.), and G. J. I. Linklater, O.B.E., M.D., D.P.H., D.T.M. & H., M.R.C.P. (Edin.). E. & S. Livingstone: Edinburgh, 1930. Pp. 211. Illustrated. Price, Rs. 3-12. Available from Messrs. Butterworth & Co. (India) Ltd., Calcutta.

THE authors' aim is to provide a small handbook embodying all that nurses should know of hygiene. It is based on the syllabus issued by the General Nursing Council. They claim to emphasise the importance of the personal as opposed to the communal aspects of hygiene—the chapter on the nurse in her relation to public health might well have come as an introduction. Environmental hygiene is dealt with in Part I—condensed but adequately. The modern ideas

of ventilation are hardly sufficiently emphasised, and too much reference made to CO<sub>2</sub> standards and the amount of air, rather than to its quality and movement. The chapters on personal hygiene and food are well written and informative. There seems to be no reference to the value of tomatoes as easily available sources of vitamins, and the percentages of iron on page 155 are surely too high; eggs, too, do not contain carbohydrates as stated. Nurses will find the book useful in preparing for examinations but we doubt if many of them will refer to it afterwards. The only references to tropical diseases and conditions are contained in the following statements on page 107:—

"Thus the females of various species of the *Anopheles* mosquito often carry and inoculate into those whom they bite the malaria parasite and the unknown virus which causes dengue, or 'break-bone' fever. Similarly, mosquitoes of the *Culex* family transmit tropical sleeping sickness (not to be confused with the sleepy sickness, or encephalitis lethargica, of this country), dengue fever and, possibly, Mediterranean yellow fever."

These are rather extraordinary statements at this time of day!

A. D. S.

**A HANDBOOK OF THE MOSQUITOES OF NORTH AMERICA.**—By Robert Matheson. London: Baillière, Tindall and Cox. 1929. Pp. XVII plus 268 with 25 plates and 23 figures in the text. Price, 25s. net.

In this book, Professor Matheson gives a concise account of mosquitoes in general and of the North American mosquitoes in particular. In the first part of the book, he deals with the general morphology and life-history of the mosquitoes, discusses their relation to disease transmission and gives a résumé of the different methods of mosquito control. The latter part of the book deals with the descriptions of the common mosquitoes of North America and keys are given to their identification. This well got-up book is splendidly illustrated and it will be a useful handbook for those interested in North American mosquitoes and malaria control.

M. O. T. I.

#### BAILLIERE'S "MALE AND FEMALE ATLASES."

MESSRS. BAILLIÈRE, TINDALL AND COX ask us to announce that Baillière's "Atlas Models of the Anatomy and Physiology of the Male and Female Human Bodies," popularly known as Baillière's "Male and Female Atlases" were reduced in price on April 1st to 5/- each.

Until the war all atlases of a similar character were of foreign origin and their accuracy was not above suspicion. These atlases are entirely British and every care has been made to render them scientifically correct. They are actual reproductions in colour, toned to nature, and show the complete anatomical relations of organs and structures in a way which for teaching and learning purposes could hardly be improved upon.

**VARICOSE VEINS, HÆMORRHOIDS, VARICOCELE, HYDROCELE AND THEIR TREATMENT BY INJECTIONS.**—By R. Thornhill, M.B., Ch.B. Second Edition. London: Baillière, Tindall and Cox. 1930. Pp. XIV plus 112. Price, 5s. net.

SEVERAL books have recently appeared that deal with the injection treatment of varicose veins and hæmorrhoids. Mr. Thornhill has gone one better than his predecessors, for in this small volume he not only discusses the treatment of these two conditions, but also that of varicocele and hydrocele.

Lord Moynihan writes a foreword and in it states, "It is an advantage to the whole profession when a man of skill and wise judgment places his experience at the disposal of his colleagues."

The reviewer would add that the advantage is increased when all the important facts and details are included within one hundred pages.

The style is clear and simple. The important points are emphasised a series of "Donts" at the end of each chapter are of real value to those who are learning the technique of injection treatment.

In India there is a vast scope for this method and particularly in the treatment of hæmorrhoids. If it is possible to learn the method correctly from a book alone, this is the book, and therefore it will be of great value to those who wish to carry out this modern treatment instead of the older and now almost discarded operative procedures.

H. H.

**CORONARY THROMBOSIS.**—By Samuel A. Levine. London: Baillière, Tindall and Cox. 1929. Pp. 178, with 1 plate and 85 text figures. Price, 13s. 6d. net.

DURING recent years the clinical recognition and investigation of coronary thrombosis has formed an important chapter in the literature of diseases of the heart. As a post-mortem condition it was well known, but was considered to be a pathological curiosity and only of importance as one of the causes of sudden death.

Dr. Levine who has been interested in this subject since its first recognition as a clinical entity has produced a very interesting and complete monograph which is based on the study of 145 cases which were seen at the Peter Brent Brigham Hospital.

This number alone will indicate the importance of the condition, which always is severe and frequently fatal.

It is interesting to learn that although the clinical features of coronary thrombosis were accurately described more than 15 years ago, and that in America a gradually increasing literature arose, it was not until 1925 that it was considered as a specific problem in England.

Indeed in the last work of Sir James Mackenzie on angina pectoris published in 1924 it is apparent that he had not diagnosed coronary thrombosis during life.

Dr. Levine presents his subject in a clear and authoritative manner. The symptoms are very well described and discussed. The difficulties of differential diagnosis are emphasised and the importance of the electrocardiograph as a means of diagnosis is stressed. Treatment is chiefly symptomatic until complications arise, but much can be done to relieve the patient.

A large part of the book is occupied by summaries of the 145 cases. These are valuable and help one to realise the variations that may occur in this very definite clinical entity.

We do not know of any other book that describes this condition with such detail and clearness. It should prove invaluable to all physicians who are interested in diseases of the heart.

H. H.

**AFFECTIONS OF THE EYE IN GENERAL PRACTICE.**—By R. Lindsay Rea, M.D., M.Ch., F.R.C.S. London: H. K. Lewis & Co., Ltd. 1930. Pp. XVI plus 155, with 7 coloured plates and 33 other illustrations. Price, 10s. 6d. net.

THIS small book is not intended to be a textbook in ophthalmology, but to help the general practitioner whose knowledge of ophthalmic training is generally somewhat limited and to whom the author has dedicated his book.

The book is made up of seventeen articles originally written for the *Medical World* and now amplified and published in book form.

The book is written in a clear and simple style and the author puts forward the rules which should guide the general treatment of most eye diseases. The illustrations are good and mainly original. The chapters on examination of the eye in diseases of the nervous system, and the localising value of the eye symptoms

in the diagnosis of diseases of the brain form interesting reading. It is a pity that the large and important subject of glaucoma is not discussed in more detail.

The author's operation of choice for the removal of cataract is the simple extraction, with which we cannot agree as the operation of choice for India, inasmuch as iris prolapse is much commoner, and moreover the prolapse is usually larger and more difficult to deal with; a peripheral buttonhole iridectomy combines greater safety with the advantages of a round pupil.

A list of therapeutic formulæ completes the book.

For the general practitioner the book will be found most useful, especially to doctors in the mofussil, where specialised assistance is not often obtainable.

E. O'G. K.

**TECHNIQUE OF CONTRACEPTION.**—By J. F. Cooper, M.D. New York City: Day-Nichols, Inc. 1929. Pp. 271, with 25 illustrations.

Books on contraception are now numerous, but this book has the merit of being carefully and sanely written, and of being written for the medical profession only. The author is Medical Director of the American Birth Control League; in his preface he writes, "The chief aim of the author in writing this book is to set forth all the available scientific data of importance on this subject in such manner that the physician will have available the necessary information to enable him to prescribe for those of his patients who in his judgment need contraceptive advice. He also emphasises the extent of the popular and scientific interest which has already been manifested in the subject, and points out the responsibility of the medical profession in this new field."

Since contraception has come to stay, it is now most important that the subject should be studied scientifically by medical men, since at present much of the literature on it is by laymen, and a great deal of propaganda is put out by advertisers based, as far as one can see, on but little scientific evidence. The present book is based on a twelve years' study of the subject on more than 8,000 clinical cases observed between 1923 and 1928. It gives in detail all methods commonly adopted, mechanical and chemical. Permanent methods of sterilisation are also considered. An important chapter for the medical man who is consulted on this subject by his patients is the one on contraceptive fallacies. Three chapters then follow giving the results of exhaustive enquiries as to the value of different methods and statistical data. Clinics in America and Europe are dealt with, the legal aspects of contraception with special reference to the laws in different States in the United States, and a useful bibliography completes the volume.

In Chapter VIII the author details the method which has been found most successful and harmless in his experience of more than 1,600 cases in which it has been used. This is the occlusion of the cervix uteri by a rubber check pessary of either "Mensinga" or "Ramses" type, which should be fitted in the first instance by the physician, together with the use of a contraceptive jelly. The formula of the latter is—

Glycerine	} as glycerine starch
starch	
Boric acid,	4%
Lactic acid,	1%

and it is put up in a collapsible tube, with a long vaginal nozzle for injection.

Indications and contra-indications for various methods are detailed. The book is strictly ethical, is issued only to medical men, is entirely free from any trace of eroticism or of "sex education"; in brief it is a manual on a new medical subject. It is exactly what is wanted to give the practising physician the knowledge with which to advise those who consult him in such matters.

## Annual Reports.

**ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1927. VOL. I, WITH APPENDICES. BY COL. J. D. GRAHAM, I.M.S. CALCUTTA: GOVERNMENT OF INDIA, CENTRAL PUBLICATION BRANCH. 1930. PRICE, RS. 2-8 OR 4s. 6d. NET.**

GENERAL GRAHAM's review of the sanitary situation in India in 1927 comes at a very opportune time. Nine years after the introduction of the Reforms Act which had the effect of transferring Public Health almost entirely to Provincial Governments, it is possible to consider the effect of this policy on health conditions in India generally and on the development of health activities. We gather that General Graham's opinion is that though in the provinces generally there has been some forward movement in policy and activities, these have been unequal and variable, and that the loss of some co-ordinating central agency has been felt. General Graham is of opinion that some form of Central Ministry of Health is necessary and desirable, but he does not in this report state what form this Ministry should take, how it should be constituted and what co-ordinating agencies it would have. We presume that he has already given his opinions on those matters to the Simon Commission, the report of which we look forward to with considerable interest, as we believe that a great deal of the fatalistic, morbid, despondent and pessimistic outlook on life which characterises the Indian community at present, is in great measure due to the insanitary conditions and liability to epidemics of disabling disease which now beset them.

General Graham is cautious in his optimism as to what the altered conditions and relations, which would ensue on the formation of the Ministry of Health, could actually achieve in India, but he is right when he says that the formation of a sound sanitary policy all over India co-ordinated by a central body would at least lead to some steady development and progress even though it were slow. There is a very interesting chapter on the sanitary relationship of India with the outside world. India is represented by the Public Health Commissioner on the Office International d'Hygiene Publique and on the Health Committee of the League of Nations. He is also a member of the Singapore Bureau of the League of Nations. In these capacities India is brought into close touch both with the European and with Far Eastern nations, and during the last few years a tremendous lot has been done by all these bodies in disseminating information with regard to India and its problems and its work among the nations of the world. It is now realised by outsiders what tremendous problems and difficulties India has to face and what a tremendous lot has been done in the study of these problems and in the application of this knowledge to tackling the conditions which produce disease. The Singapore Bureau is proving of very great use to Asiatic and Australasian countries and to shipping. Information regarding the amount of infectious disease in ports and among shipping is now being very expeditiously broadcasted and both ports and ships are aware of the extent of infectious diseases in their vicinity or destination in good time to take any necessary action they may think fit under the circumstances. The Singapore Bureau now acts as a regional bureau under Article 7 of the International Sanitary Convention of 1926 which, by the way, has not yet been ratified by India though it has been so ratified by practically every other signatory country. The Singapore Bureau has an Advisory Council and sub-committees which take up and discuss extremely important matters in which eastern countries are particularly interested.

tonsillitis, and inflammation of areolar tissue, in order of importance. Invaliding amounted to a figure of only 9.06 per 1,000 for the whole Army, as compared with a general figure of 12.15 for the five-year period 1923-27. Middle ear disease and tuberculosis are the two most prominent causes of invaliding. A lowered incidence of influenza and venereal diseases in the Home commands led to a marked reduction in the average number of constantly sick.

Turning to the principal diseases affecting the Army (ex-India) as a whole, there were two very small outbreaks of diphtheria, one at the School of Electric Lighting at Gosport (8 cases), and 21 cases at the Duke of York's School. Both outbreaks were rapidly and effectually controlled by the use of the Schick test and active immunization of all positives. Dysentery was most prevalent in the Indian command, 15.6 per mille, next in the China stations, 8 to 15.3 per mille. Excluding India, enteric fevers only accounted for an admission rate of 0.3 per mille, but there was a small outbreak with 20 cases in connection with the Aldershot manoeuvres. No less than 98.3 per cent. of troops are protected by anti-enteric inoculation. Influenza was at a low level in 1928.

Malaria accounted for 6,550 admissions, but India showed a decrease of 2,581 cases on the previous year. The total incidence in the Army was 35.7 per 1,000 troops; West Africa came first with an incidence of 289.6, and India second, 138.3. Increased incidence was noted in Mauritius and South China. In the Sudan an outbreak occurred at Khartoum in January-February, the laboratory findings for which gave:—

<i>P. vivax</i>	..	..	115 cases.
<i>P. malariae</i>	..	..	20 "
<i>P. falciparum</i>	..	..	116 "

The following figures are given for cases in the entire Army diagnosed by laboratory findings:—

	India.	Other Commands.
<i>P. vivax</i>	.. 3,948	770
<i>P. malariae</i>	.. 8	32
<i>P. falciparum</i>	.. 650	282

Relapses accounted for 52 per cent. of the admissions in India, and 38 per cent. in Egypt. There was a marked reduction in the percentage due to relapses, however.

Pneumonia accounted for an admission rate of 3.3 per mille. At Woolwich 31 cases occurred with only one death, and the infecting organism was found to be Friedlander's bacillus; a feature of this series of cases was that crisis occurred about the fourth day. Rectal injections of potassium permanganate solution and injections of thyroid extract appeared to improve the course of the cases. Sandfly fever showed a high incidence in Iraq (260), Malta (117), and less in Egypt (39) and India (37 per mille). The incidence in Malta was twice that of the previous year, the disease occurred from June to October, and the Devonshire Regiment, with 170 admissions, suffered severely, having been stationed in Floriana barracks. Extra electric fans were installed as a prophylactic measure. Heavy rains in April mean many sandflies in the summer, whilst it is noted that ammonium bromide was most efficacious in relieving the headache.

"Pyrexia of uncertain origin" has fallen from an incidence of 28.8 per mille in 1908 to 0.7 per mille in 1928—a sufficient indication of the ever-increasing importance of laboratory and clinical diagnosis in military medicine. During the year a group of 254 such cases, which in previous years would have been diagnosed as sandfly fever, dengue, or "P. U. O.," was returned with a diagnosis of intestinal toxæmia.

The admission rate for pulmonary tuberculosis was 1.1 per mille—a figure equal to that for 1926, and the lowest on record. Here the importance of such previous entries as bronchitis, pleurisy, and influenza on the medical case history sheet is emphasised. Venereal diseases showed their highest incidence in the China commands, and the lowest in the Home commands.

Cases of encephalitis lethargica were reported from India, China, Egypt and the Rhine, mostly cases diagnosed in the post-encephalitic stage.

Functional nervous disorders are important in military medicine, and for 1928 in the British Army neurasthenia accounted for an incidence of 1.2 per 1,000 and disordered action of the heart for one of 2.6. A special analysis was made of 154 cases of "hysteria." Sixty per cent. of these occurred during the first two years of service, and in general one must postulate some constitutional defect in these patients which renders them unadaptable to service conditions. Twenty-five per cent. of all cases were invalided, mainly those with mental symptoms, commonly of anxiety neurosis type. Ten cases of "hysteria" from Aden were largely due to auto-suggestion and fear of beriberi.

Eye diseases were not important, the admission rate being 4.2 per 1,000 strength, and the chief diseases conjunctivitis and inflammatory conditions of the cornea. Middle ear disease accounted for 865 admissions, a rate of 4.7 per mille; here there has been a marked improvement of recent years. Tonsillitis gives year by year a constant incidence of about 33 to 34 per mille; it is largely due to the soldier's habit of visiting cinemas and other crowded places of entertainment, and specially high incidence is shown in the Eastern Command (54), and the Home Counties (West) Area (95.5), both associated with a crowded environment. There were 743 operations for appendicitis with a total mortality following operation of only 0.53 per cent. Admissions for fractures numbered 1,942, with 25 deaths.

The "special departments" in the R.A.M.C. are of relatively recent development. Thus the first specialist in medicine was appointed in 1920; in 1928 there were 19 officers qualified to fill such appointments, 10 of whom held the M.R.C.P. Several interesting case reports are included in the narrative, and it is noted that cases of gastric and duodenal ulcer, whether treated by medicinal or surgical measures, are sooner or later found unfit for military service. The permanganate treatment of pneumonia has been found of great value in a group of 64 cases treated in Cairo with only 4 deaths; an enema is given, followed by rectal injection of 1 pint of a solution containing 2 grains of potassium permanganate. This is repeated each evening for the first few days. At the same time two injections a day, each of 2 grains of thyroid extract, are given daily until the crisis appears. It is reported that cases show but little toxæmia under this line of treatment. Liver and liver extracts have proved of value in the anæmia of sprue. Papine, a morphia derivative, given by oral administration, has been used with marked sedative effect in acute rheumatism, pneumonia, sciatica, and fibrositis.

In surgery the high standard set during previous years has been well maintained. The mortality following 544 operations for appendicitis was only 0.73 per cent. The injection sclerosing treatment of varicose veins has given excellent results. Sterilisation of instruments, etc., is now carried out either by electricity or steam, as it is considered dangerous to have a naked flame near any anæsthetic vapour. A new type of first field dressing is under consideration. In general in military hospitals in Great Britain ether by the open method or in Shipway's apparatus was the general anæsthetic of choice. The X-ray, electrotherapeutic, and ophthalmic departments maintained a high standard of work. The special committee on middle ear disease in the Army reported during the year.

In sanitation and hygiene many improvements in barracks in various stations are noticed. Rations in general are of excellent quality, but sometimes deficient in green vegetables. At the Hygiene Department of the Royal Army Medical College, three ordinary and two specialist classes were held during the year, and were attended by R.A.M.C. and I.M.S. officers, and lieutenants of both services on probation. The Thames flood of January 6th to 7th flooded the basement of the



Hygiene Department, and wrecked the hygiene museum and the research laboratory; both have since been reorganised. A total of 81 officers and 662 other ranks attended courses of instruction at the Army School of Hygiene during the year.

In the Pathology Department of the Royal Army Medical College a total of 101 officers of the R.A.M.C. and I.M.S. attended the courses during the year, whilst 4 officers qualified as specialists in pathology. The Pathological Museum now includes some 3,000 specimens. The routine preparation of vaccines of different types for issue is a specially noteworthy activity in this department. Vaccines against the *B. aertrycke* heated to 100°C. appear to have an immunizing value equal to that of those prepared in the usual way. A special study is being made of the serological reactions of bacteria of the Brucella group. At Cairo it was found that the use of Dreyer's technique shows that many of the "pseudo-dysentery" bacilli are true dysentery bacilli, which will agglutinate with the specific anti-serum if Dreyer's technique be used. At Hong Kong a special association was noted between jaundice and Ascaris infection. At Woolwich gonococcus "exotoxin" vaccine has been extensively tried out. This is given intradermally, and the urine is controlled so that its pH lies between 7.2 and 7.4. This line of treatment gives satisfactory results; special diet and rest in bed are not necessary for early and uncomplicated cases. Five papers on research work were published from the Department in the *Journal of the Royal Army Medical Corps*.

The establishment of the Army Dental Corps was increased by 7 officers during the year. A table on p. 45 of the report shows the great volume of useful work carried out by this department; "a high standard of oral hygiene was maintained" says the report. With regard to the medical examination of recruits, 53,075 recruits were examined during the year and 18,481 rejected either on examination or within six months of enlistment,—3482 per 1,000. Disease of the middle ear is the chief cause of rejection, followed closely by loss or decay of many teeth. Defective vision, defects of the lower limb from fracture, luxation, etc., and diseases of the heart are also important causes of rejection. The question of middle ear disease has become so important that electric auriscopes are being supplied to those engaged in the medical examination of recruits.

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The second part of the report deals with the health of the Army in the various commands. Here it is the section on India, pp. 78 to 102, that will chiefly interest our readers. The admissions to hospital were: for officers 551 and for soldiers 586.6 per 1,000 of the strength. These figures are very appreciably higher than those for the Army ex-India, but not so very much higher if the climatic conditions be considered. In order of importance the principal diseases concerned were malaria, inflammation of areolar tissue, sandfly fever, gonorrhoea, tonsillitis, dysentery and diarrhoea. There was a very considerable fall during the year in the admissions for malaria and venereal disease. Otitis media and pulmonary tuberculosis were the two chief causes on invaliding to the United Kingdom. The death rate in the Army in India from all causes was only 3.09 per mille—a most satisfactory figure.

Turning to the principal diseases in the Indian commands, dengue chiefly affected the troops in Rangoon, Calcutta, and Madras. The admission rate for dysentery was 15.6 per mille, of which quite two-thirds were of bacillary origin. Admissions for enteric fevers were 3.5 per mille, the laboratory diagnosis being proved in 41 per cent. of the cases which occurred; 97.7 per cent. of the British troops in India are protected by inoculation. Approximately 99 per cent. of the troops are protected by vaccination against small-pox, and only 2 admissions occurred, with no death. The question of whether any short fever of undetermined origin exists in India is fully considered under the heading "pyrexia of uncertain origin." Very extensive laboratory

examinations were carried out in such cases at several centres; some of these cases are probably enteric fever of short duration, others due to intestinal toxæmia, and to infections with the *Salmonella* group of organisms.

Venereal diseases showed a lowered incidence, 42 per 1,000 as compared with 49 per 1,000 in 1927. Gonorrhoea accounts for more than 70 per cent. of the admissions. Rangoon and Maymyo show the highest incidence for these diseases. Respiratory diseases accounted for an admission rate of 22.9 per mille, diseases of the digestive system caused 5,612 admissions. Ten cases of liver abscess occurred, whilst 236 cases of appendicitis were operated on with 4 deaths.

A general note states that, whilst British military hospitals in India are not yet up to modern requirements in all cases, yet they are much more satisfactory than the Indian military hospitals. At many stations operating theatres have been improved, in others modern accommodation for maternity work has been provided, isolation blocks have been provided in some centres, and new dental centres opened in others. The treatment of all cases of middle ear disease by specialists in otology has led to a marked reduction in the amount of invaliding for this condition. The establishment of clinical rooms in hospitals has greatly improved clinical laboratory diagnosis, especially with regard to malaria. Several different lines of treatment for relapsing benign tertian malaria have been under trial; quinine plus arsenic; quinine plus plasmochine, etc., and the results have been published in the journals. There was a steady improvement in the hygiene of barracks and in water supplies; a notable feature of the year was the opening of the new "model" cantonment at Mingaladon near Rangoon; the barracks are supplied with electric light and punkas, the water supply is from deep wells, and the sewage is water-borne. Large numbers of married quarters have been reconstructed, and other new ones built. Anti-malaria measures have progressed steadily in scope and thoroughness during the last five years; a greater number of troops are sent to the hills each year, whilst mosquito-proofing of barracks is being extended.

It is noted that enteric fever in India may assume the most protean forms; thus the *B. typhosus* was isolated from a typical case of sandfly fever on blood culture; a case of broncho-pneumonia with empyema gave the *B. typhosus* on blood culture; a case of acute nephritis, with blood and casts in the urine, yielded the *B. paratyphosus A* on blood culture. With protective inoculation and improved methods of bacteriological diagnosis it is being realised that many aberrant, atypical, and sometimes short-term cases of enteric fevers occur.

A scheme was introduced by which units were permitted to draw less than the full rations allowed, and to draw the remainder at half cash values. Whilst primarily designed to prevent waste, it is noted that the unit which showed the greatest saving was considered on inspection to be the best fed unit in the Northern Command. The work of the Military Food Laboratory has proved invaluable; thus of 7,659 samples received, 440 were rejected; this work is especially important in a country where adulteration of food-stuffs is the rule rather than the exception.

The pathological service in India progressed steadily throughout the year. New district laboratories were built at Quetta, Meerut, Peshawar, Razmak and Trimulgherry, and a new brigade laboratory at Mingaladon. Other laboratories were improved, and several courses of laboratory instruction were held at many centres.

Results from laboratory centres all over India prove that everywhere, where laboratory diagnosis is available, the proportion of cases of bacillary to those of amœbic dysentery rises. "Amœbiasis is undoubtedly very prevalent among the local population in contact with troops" states the report, "but apparently the infection is communicated to the troops with greater difficulty than is the case in bacillary infections." The



following figures for laboratory diagnosis in cases of acute dysentery are very significant:—

Number of cases examined ..	4,567
Typical bacillary exudate microscopically ..	2,098
Indefinite exudate microscopically ..	1,214
<i>B. dysenteriae</i> isolated ..	1,074
<i>E. histolytica</i> present ..	255

In convalescent cases, on the other hand, the isolation of dysentery bacilli is very difficult.

Immunization against bacillary dysentery by oral administration of bilivaccin was carried out in the Quetta, Poona, and Secunderabad commands; the results were very dubious. The agglutination reactions in persons re-inoculated with a single 1 c.c. dose of T.A.B. vaccine suggest that the protection so afforded is not satisfactory, and it is advised that two re-inoculations, of 1/2 and 1 c.c. respectively, be given. Evidence is gradually accumulating that organisms of the *Salmonella* group are responsible for a certain percentage of enteric-like fevers of short duration.

An enquiry of special importance relates to the examination of menials who have to do with the handling of food supplies, water supplies and cooking utensils for British troops. It is almost impossible to secure routine bacteriological examinations of such individuals, but the following results of the examination of faeces are of interest:—

Number examined ..	12,298
Bacilli of enteric group isolated ..	11
<i>B. dysenteriae</i> (Flexner) isolated ..	30
<i>B. dysenteriae</i> (Shiga) isolated ..	7
<i>E. histolytica</i> cysts found ..	624
Ova of <i>Tænia saginata</i> found in ..	43
" " <i>Hymenolepis</i> ..	68
" " <i>Ascaris lumbricoides</i> ..	616
" " <i>Ancylostoma duodenale</i> ..	488
" " <i>Necator americanus</i> ..	127

The difficulty of dealing with these carriers is enormous; whilst frequently several examinations are necessary before the suspect is proved to be a carrier.

The construction of the Enteric Laboratory at Kasauli was completed; this laboratory now issues high titre sera and standardised agglutinable emulsions wholesale. All British soldiers who have suffered from enteric fever are sent to this depot for bacteriological examination before being passed fit as non-carriers; 177 such convalescents were dealt with during the year, and 3 of them, who were found to be chronic carriers of the *B. typhosus*, were invalidated to the United Kingdom.

Owing to the numerous samples of sera for the Wassermann test which arrived septic and hæmolyzed, or with the capsules broken at the Central Dermatological Laboratory at Poona, during 1928 the carrying out of this test was decentralised to the laboratories at Poona, Quetta, Meerut, Rawalpindi, and Maymyo. The results show a great diminution in the numbers of capsules arriving in the laboratory either broken in transit or with the contained sera septic and hæmolyzed. The total number of tests carried out in 1928 was 17,865.

Eight papers by specialists in the pathology department were published during the year in the *Journal of the Royal Army Medical Corps*, and one in the *Indian Medical Gazette*.

\* \* \* \* \*

With regard to stations outside India, in Aden the admission rates were: for officers 905 per 1,000, and for soldiers 777, the chief diseases responsible being dengue and malaria. In Ceylon the corresponding rates were 240 and 589 per 1,000, malaria being of very light incidence; there were 3 deaths from lightning. Egypt gave corresponding rates of 275 and 482, with tonsillitis, malaria, sandfly fever, and gonorrhœa predominating as causes of sickness. In the statistics for Malaya dengue and venereal diseases are prominent, whilst in Mauritius malaria was the chief cause of sickness. In Iraq there were only 52 admissions to hospital, of which 13 were due to sandfly fever.

## LONDON SCHOOL OF TROPICAL MEDICINE. REPORT ON THE WORK OF THE SCHOOL FOR THE YEAR ENDING JULY 31ST, 1929.

THIS report shows how rapidly the newly re-constituted London School of Hygiene and Tropical Medicine is coming into its own, and how its activities are extending in every sphere of teaching and research work. Even by August 1929 building and furnishing had still to be completed in several of the sections, but the scheme was almost completed. In the Division of Epidemiology and Vital Statistics a whole time assistant lecturer and two visiting lecturers were appointed to strengthen Professor Greenwood's staff: the Division of Bacteriology and Immunology absorbed the former Department of Pathology and Bacteriology, and an extra demonstrator was appointed; Professor Jameson took up his appointment as Director of the Division of Public Health on January 1st, 1929, and a part time Assistant Director was appointed, also a Divisional Assistant and two part time lecturers. Dr. G. P. Crowden took over charge of the Section of Physiology as applied to Hygiene, and Lieut.-Col. G. E. F. Stammers, lecturer in tropical hygiene, was given a place in the Division of Public Health. A specially appointed committee reported on the arrangements to be made for the D.P.H. curriculum, and a fully drafted scheme for this purpose came into working order in October 1928. Professor Hartley having resigned his post as Director of the Division of Biochemistry and Chemistry as applied to Hygiene, through ill-health, Dr. H. Raistrick, B.A., D.Sc., F.I.C., was appointed in his place. A lecturer and demonstrator were also appointed. The former Division of Tropical Medicine and Hygiene at Endsleigh Gardens has now become a separate Division in the new building. Dr. Hamilton Fairley, O.B.E., was appointed Lecturer in Applied Pathology in this Division, and is also Assistant Physician at the Tropical Diseases Hospital. Lieut.-Col. H. Kirkpatrick replaced Lieut.-Col. R. H. Elliot as Lecturer on Diseases of the Eye, the latter having reached the age for retirement. These and other changes and new appointments show how the staff has been strengthened and enlarged, and adapted to the needs of the new institution.

Under the new arrangements the course of instruction in tropical medicine and hygiene now lasts for 20 weeks, instead of for 17 weeks as formerly. The winter course runs from October to February, and the spring course from February to July. Special new lectures, etc., arranged are instruction in the use of a library, demonstrations on how to run a museum, a lecture on the practice of medicine in the tropics as compared with practice in temperate zones, one on drugs used in tropical medicine, one on the influence of climate and environment on hygiene in the tropics, a lecture on the laws of scientific method, and instruction in the use of the microscope. In the academic year ending July 1929, 166 students attended the various courses of instruction; 102 passed the School examination in Tropical Medicine and Hygiene out of 116 competing, and 71 gained the D.T.M. & H. (Eng.), out of 116 competing. One student took the M.D. in tropical medicine at London University, and four the Diploma in Bacteriology (London). Of the 166 students who attended, 44 were destined for India, 29 for West Africa, 23 for East Africa, 11 for Egypt, and 11 for the F.M.S. and Straits Settlements. Additional courses were also held in parasitology as applicable to English public health practice, in connection with the Fellowship of Medicine, clinical instruction in connection with the D.T.M. & H. (Cambridge), clinical instruction to medical officers of the Royal Navy, a special course in malariology in conjunction with the League of Nations, and a course in tropical hygiene for I.C.S. and similar probationers.

The reports by the different Directors of Divisions and Departments follow. In the Division of Public Health, Professor Jameson reports on the drawing up of the new D.P.H. curriculum. Professor Greenwood records the transfer in August 1929 of the Division of

Epidemiology and Vital Statistics from the National Institute of Medical Research at Hampstead to the new School buildings. Advanced teaching of post-graduates has been commenced. A comment is made on the difficulty of teaching foreign students whose knowledge of English is weak, also on the English post-graduate's ignorance of French and German. In the Division of Bacteriology and Immunology Professor Topley records research work on the study of experimental epidemics, under a grant from the Medical Research Council; a study of the variations in virulence of the *Bact. aertrycke*, studies in bacteriophage, on antibodies to bacilli of the *Salmonella* group of bacteria, and on the bacterial flora of the nasopharynx. Professor Leiper, Director of the Division of Medical Zoology, reports on the organisation and staffing of this department. The Department of Entomology, under Dr. Buxton, was about to move into new quarters at the close of the academic year. Dr. Wigglesworth studied blood digestion in *Glossina* flies. Miss E. K. Sikes, ph.d., discovered the first known parasitic Hymenopteron—*Bairamlija fuscipes*—on a flea, and succeeded in experimentally parasitising fleas of genus *Xenopsylla* with these insects. Work on the ecology of British mosquitoes was carried out by Dr. Mary Beattie and Mrs. L. J. Howland. Mr. H. S. Leeson returned after three years of field work in Rhodesia.

In the Department of Helminthology, Professor Leiper records research work on the helminth fauna of sewage, the invasion and destruction of helminth eggs by fungoid parasites, the identification of a miscellaneous collection of worms from West Africa, and of another collection from the West Indies. The wild monkeys of St. Kitts have been discovered by Dr. Cameron, during his visit to that island, to be natural reservoirs for infection with intestinal bilharziasis. The field work at Winches Farm, St. Albans, was continued. In the Department of Protozoology, Dr. Thomson records special work on cultivation of different strains of *Leishmania* and *Trypanosoma cruzi* by Dr. Chandra Ray from the School of Tropical Medicine at Hamburg; research work on the effect of various arsenicals in bird malaria by Dr. Scott Macfie. Dr. Andrew Robertson visited Spanish Honduras, on the invitation of the United Fruit Company, to study malaria in that region. In the Department of Tropical Pathology and Bacteriology there is recorded research work on the fungi associated with diseases of economic importance and on the *Brucella* group of organisms. The Division of Tropical Medicine and Hygiene under Sir Andrew Balfour, Director of the School, had only just been organised and got together. Dr. Manson-Bahr continued his valuable studies on the sigmoidoscopic appearances of the bowel in intestinal diseases, and Dr. H. Willoughby worked on the metabolism in sprue.

The newly organised library of the School was opened in September 1928, with Dr. Haslam of the Bureau of Hygiene and Tropical Diseases as Director, and Mr. R. L. Sheppard of the same Bureau as Assistant Director. (Anyone connected with the work of organising and maintaining a medical library in the tropics would do well to consult the portion of this report dealing with this subject. The organisation of the new library at the School is clearly a very sound one, and the development of an "information service" is envisaged.) The Museum, under Sir Wilfred Beveridge as Director, and Dr. Newham as Curator, has made notable progress, and in course of time will undoubtedly become the most important museum of its type in the British Empire.

An extremely interesting summary review of the research work carried out in England, in the field in the tropics, and in connection with agricultural parasitology is then given, and the report closes with an appendix of six pages, giving the titles of papers and reports published from the School during the year under report.

The above summary may show something of the very fine work carried out by the London School, and of the very widespread character of its activities.

## Correspondence.

### ANAPHYLACTIC SHOCK AFTER MILK INJECTION.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I have read with much interest the article on protein therapy by Green-Armytage and Mitra in the April issue of your journal. The technique of it is so simple and so varied are its therapeutic applications that milk injection is now coming to be regarded as a valuable addition to the armamentarium of a physician. I have used it in a number of cases of obstinate eye troubles and skin conditions with striking results and with no ill effects whatever.

Recently however in a chronic case of interstitial keratitis in a Hindu woman of 18 years I gave two injections of milk of 5 c.c. each at intervals of four days. Injections were given deep in the buttock. The patient felt malaise but there was no rise of temperature. A third injection of 6 c.c. of milk was given again after four days and this time barely had I finished the injection when the patient began to groan. She became very restless, complained of giddiness in the head, jumped up on the bed and was covered with profuse perspiration. Her look became anxious and in fact she presented all the symptoms of an anaphylactic shock. A dose of adrenalin however quickly made her comfortable. As such a case has not been reported before I would be obliged if you would kindly publish the matter in your journal.—Yours, etc.,

J. N. PAUL, M.B.

121-2, CORPORATION STREET,  
CALCUTTA.  
1st May, 1930.

### INTRAVENOUS QUININE IN MALARIA.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—There is such a conflict of opinion on this subject, that I beg for space in your columns in which to record my own experience of it. Some writers even go so far as to sound a note of warning against the intravenous administration of quinine.

My experience of intravenous quinine in the treatment of malaria dates from the time when I joined this institution in March 1928, and came to serve under Lieut.-Col. A. S. Leslie, I.M.S. Since then under his guidance and instruction, I have treated every case of malaria in which parasites have been found in blood films by intravenous quinine. I have seen none of the untoward effects reported by some writers, and Colonel Leslie informs me that he has seen none either.

Up to date I have treated 284 cases of malaria by intravenous injections of quinine, and have not seen a single untoward result in any of my cases. The technique is very simple. Quinine acid hydrochloride, gr. x, is dissolved in 10 c.c. of distilled water, boiled for 15 minutes, and then cooled. This solution is injected slowly into the median basilic vein once a day, preferably in the morning, with all antiseptic precautions, and this treatment is continued daily for six days. (The above dose is of course for an adult.)

I have not seen a single rise of temperature above normal in any of my cases after the 3rd or 4th day after commencement of this treatment, and the asexual forms of the parasites disappear from the peripheral blood by the 6th day at latest. Patients who show gametocyte forms after six injections of quinine are then given a course of N.A.B. injections. After six injections (gr. 60 in all) have been given by the intravenous route, the patients are put on to quinine mixture, 1 oz. t.i.d., for 15 days, and are then discharged.

All the above 284 cases were treated on these lines and were discharged cured. Over 1,500 intravenous

injections, each of gr. x of quinine, have been given without the occurrence of a single untoward symptom. I have seen no heart failure, respiratory embarrassment, phlebitis, thrombosis, or cellulitis or abscess at the site of injection. All these patients were on ordinary diet from the commencement of treatment.

Of these 284 cases of malaria treated so far, only 4 or 5 returned with a relapse, and in each instance more than six months after they were discharged, so that the "relapse" was probably a re-infection.

Turning to the criticisms of intravenous quinine, the one usually made is that it causes a sudden lowering of blood pressure. To test whether this occurred the blood pressure of 25 patients was taken immediately before the injection, and three times after it at intervals of 5 to 10 minutes. I admit that there was a fall of blood pressure of 5 to 10 mm. within 5 minutes of the injection, but this lowering of blood pressure disappears within 20 to 30 minutes at the latest. The addition of m. x of liquor adrenalin 1 : 1,000 to the solution for injection counteracts this fall of blood pressure, but in my experience patients tolerate the intravenous injection of quinine without adrenalin better.

The advantages of the intravenous injections of quinine are numerous. The parasites are directly attacked in the blood stream. Cerebral and other complications are averted. The effect of quinine on the gastric mucosa is reduced to a minimum, and gastric symptoms averted. Last, and most important of all, is the economy effected, the method giving the maximum efficacy of treatment with the minimum of expenditure.

I trust that readers of your journal will try the method for themselves before dismissing it with the remark that it is "highly dangerous."—Yours, etc.,

O. K. NAMBIAR,  
*Resident Medical Officer.*

GOVERNMENT LAWLEY HOSPITAL,  
COONOR,  
8th May, 1930.

## THE TREATMENT OF ULCUS TROPICUM.

*To the Editor, THE INDIAN MEDICAL GAZETTE.*

SIR,—In your issue for April 1930, Dr. Hebbar of Byndoor, South Kanara, asked for details of "Dr. Hugh Smith's method" of treatment of tropical ulcers, as carried out by me. The details are as follows:—

As soon as the patient is admitted the part is well washed with hot water. Pure iodoform is then sprinkled on the ulcer and a charcoal poultice is then applied. This process is repeated three times a day. When the slough has separated, the ulcer is dressed with normal saline lotion twice a day. Some cases were also dressed with electrolytic chlorine after the separation of the sloughs. No medicine was administered internally except to those patients who suffered from malaria or other intercurrent disease.—Yours, etc.,

M. B. DOSHI, B.Sc., M.B., B.S.,  
*Chief Medical Officer, Durgapur State.*

DURGAPUR, RAJPUTANA,  
21st April, 1930.

## A CASE OF MENINGOCELE.

*To the Editor, THE INDIAN MEDICAL GAZETTE.*

SIR,—On p. 208 of your April 1930 number, and in para (2) of the case of meningocele described by Dr. A. Bayley de Castro, I.M.D., the following words appear: "Palpation revealed a cleft in the vertebral arch, the result of non-closure of the primitive medullary groove." This must be an erroneous statement because the non-closure of the primitive medullary groove would have resulted in a myelocoele and not in a meningocele.

The development of the spinal cord from the epiblast is quite independent of that of the vertebrae, membranes of the spinal cord, spinal muscles and ligaments, which proceeds from the mesoblastic elements which intrude

themselves between the spinal cord and the skin. These are known as the 1st and 2nd development layers. An important point which the author has omitted to mention is whether the skin was adherent or not to the membranes, and whether the spinal cord and nerves were normally situated or not. I merely mention this as meningo-myelocoeles are more usual than true meningoceles.

It was a pity that Dr. de Castro did not inject Morton's fluid after tapping, as it is most suitable for meningoceles, and having antiseptic qualities it also reduces the risk of infective meningitis, which ultimately ensued. The formula of Morton's fluid is:—

R

Iodi	..	..	gr. xxx.
Potass. iodidi	..	..	gr. x.
Glycerin ad	..	..	oz. i.

This note is written, not in any spirit of criticism, but merely to preserve embryological accuracy.—Yours, etc.,

B. J. BOUCHÉ, M.R.C.S. (Eng.), L.R.C.P. (Lond.),  
*Assistant Surgeon, I.M.D.*

SIND JUNCTION,  
N. W. RAILWAY,  
27th April, 1930.

## "WETS" VERSUS "DRYS."

*To the Editor, THE INDIAN MEDICAL GAZETTE.*

SIR,—I desire to call the attention of those "wets," non-American as well as American, who favour beer and light wines, but who apparently raise their hands in horror at mention of distilled liquors, to the following passage in the Old Testament (Deuteronomy, xiv, 26):—

"And thou shalt bestow that money for whatsoever thy soul lusteth after, for oxen, or for sheep, or for wine, or for strong drink, or for whatsoever thy soul desireth....."

In this passage the Hebrew word for wine (*yayin*) is contrasted with the Hebrew word for "strong drink" (*shechar*), and the people of Israel were permitted to partake of both wine and "strong drink."

I am convinced that the "strong drink" referred to in this passage was a distilled liquor. If it had been merely a strong kind of wine, it hardly would have been sharply contrasted with wine.

It is generally supposed that distilled liquors were not known to the ancients. But such a supposition cannot be proved. It is also supposed that anaesthesia is a modern discovery. But I once came across a passage in the *De Trinitate* of Hilary of Poitiers, a writer of the fourth century A.D., that shows unmistakably that the ancients were acquainted with anaesthesia. The passage is as follows:—

"Also when through some grave necessity, part of the body must be cut away, the soul can be lulled to sleep by drugs, which overcome the pain and produce in the mind a death-like forgetfulness of its power of sense. The limbs can be cut off without pain; the flesh is dead to all feeling, and does not heed the deep thrust of the knife, because the soul within it is asleep."—

*De Trinitate, Book X, § 14.*

Since anaesthesia was known to the ancients, as I have just shown, it is likely enough that the distillation of liquors was also known to them; and the passage that I have quoted from the Old Testament goes far to confirm this supposition.—Yours, etc.,

CHARLES HOOPER.

COEUR D'ALENE, IDAHO, U. S. A.,  
11th March, 1930.

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

COLONEL C. A. SPRAWSON, C.I.E., M.D., F.R.C.P., V.H.S.,  
I.M.S., Inspector-General of Civil Hospitals, United

Provinces, is appointed Surgeon-General with the Government of Madras, with effect from the 16th April, 1930.

Lieutenant-Colonel F. Stevenson, I.M.S., Residency Surgeon, Kashmir, on return from leave resumed charge of his appointment, with effect from the 1st April, 1930.

Lieutenant-Colonel H. R. Nutt, M.D., F.R.C.S., I.M.S., is appointed to officiate as Inspector-General of Civil Hospitals, United Provinces, with effect from the 12th April, 1930 (afternoon), *vice* Colonel C. A. Sprawson, C.I.E., M.D., F.R.C.S., V.H.S., I.M.S., transferred to Madras and until further orders.

The services of Major S. L. Patney, I.M.S., are placed temporarily at the disposal of the Government of Bengal for employment in the Jails Department, with effect from the date on which he assumes charge of his duties.

The services of Major G. R. Oberai, I.M.S., are placed temporarily at the disposal of the Government of the United Provinces for employment in the Jails Department, with effect from the 28th February, 1930.

The services of Major J. L. Sen, M.C., I.M.S., are replaced at the disposal of the Government of Assam, with effect from the afternoon of the 1st April, 1930.

The services of Major R. S. Aspinall, F.R.C.S. (Edin.), I.M.S., are placed at the disposal of the Chief Commissioner, Delhi, for appointment as Civil Surgeon, New Delhi, with effect from the forenoon of the 4th March, 1930.

The services of Major G. A. Khan, I.M.S., are placed temporarily at the disposal of the Government of the Punjab for employment in the Punjab Jails Department, with effect from the date on which he assumes charge of his duties.

Major J. A. Sinton, V.C., O.B.E., I.M.S., Director, Malaria Survey of India, is appointed to act as Director, Central Research Institute, Kasauli, in addition to his own duties, during the absence on deputation of Brevet-Colonel S. R. Christophers, C.I.E., O.B.E., K.H.P., F.R.S., M.B., I.M.S.

The services of Captain Gurdial Singh Gill, I.M.S., are placed temporarily at the disposal of the Government of the United Provinces, for employment in the Jails Department, with effect from the date on which he assumes charge of his duties.

Captain S. P. Joshi, M.B., I.M.S., to be Officiating Executive Officer, Hyderabad (Sind) Cantonment, in addition to his ordinary duties, *vice* Lieutenant A. K. Nehru transferred. Dated 23rd April, 1930.

#### LEAVE.

Lieutenant-Colonel K. S. Thakur, I.M.S., Civil Surgeon, Bakarganj, is granted leave on half average pay for 3 months, in extension of the leave out of India for 12 months granted to him.

Lieutenant-Colonel R. B. Lloyd, M.B., I.M.S., Imperial Serologist, is granted leave on average pay for 6 months combined with study leave for 4 months, with effect from the 10th April, 1930, or subsequent date from which he availed himself of it.

Major S. L. Bhatia, M.C., M.D. (Cantab.), M.R.C.P. (Lond.), I.M.S., Professor of Physiology and Dean, Grant Medical College, Bombay, is granted leave on average pay for 6 months, with effect from the 4th June, 1930, with permission to prefix to this leave the period of the College vacation.

#### PROMOTIONS.

The promotion of Lieutenant-Colonel W. L. Watson, O.B.E., to the rank of Major and Lieutenant-Colonel is ante-dated to 1st August, 1919, and 1st August, 1927, respectively.

*Lieutenant to be Captain.*

K. Rai. Dated 24th January, 1930.

#### RETIREMENTS.

Colonel W. D. A. Keys, C.I.E., M.D., I.M.S. 22nd February, 1930.

Lieutenant-Colonel W. C. Ross, M.B., I.M.S., on account of ill health. 11th April, 1930.

Major E. Calvert, M.B. 12th April, 1930.  
Lieutenant-Colonel J. W. McCoy. Dated 6th April, 1930.

## Notes.

### A NEW CAPSULE FORCEPS.

By DR. G. F. ALEXANDER,  
Scarborough.



ONE is apt to fail in doing a satisfactory capsulectomy from the teeth of the forceps refusing to bite into the capsule, this being specially the case in hypermaturity from toughness of the capsule or fluidity of the cortex.

While the teeth should be as sharp as possible, they materially tend to bite into the capsule the more vertically they are inclined to it.

A more vertical inclination of the teeth to the capsule than is possible with the usual pattern of forceps is obtained by setting them on short primary arms, which in turn are opened and closed by long secondary arms. The latter are given a ring grip, and provided with a screw stop to limit the distance to which the teeth can separate to a distance not exceeding 3 mm.

The heels of the short arms are not only separated to the extent of 1 mm. but are raised 1 mm. above the level of the teeth, so that they cannot possibly grasp the iris.

The makers are Messrs. Down Bros., Ltd., 21 and 23, St. Thomas's Street, London, S.E. 1.

### HEARSON'S APPARATUS.

WE have recently received a copy of the new and sumptuous 1930 edition of the Catalogue of General and Industrial Laboratory Apparatus by Chas. Hearson & Co., Willow Walk, Bermondsey, London, S.E. 1. We need hardly remind our readers of the sound and sterling apparatus put out by this well known firm; their incubators are in use in laboratories throughout the world. The catalogue runs to 584 pages, and contains a very complete list of all apparatus likely to be required in bacteriological and clinical laboratories. Different sections deal with incubators,—of which the compartment incubators, with 8 to 9 different compartments, each of which can be opened without disturbing the rest, are a novel and interesting departure,—sterilizers, drying ovens, Wassermann baths, water baths, funnels, stills, inspissators, furnaces, centrifuges, paraffin baths and ovens, microtomes—a very wide selection,—microscopes, microscope accessories, laboratory fittings in general, laboratory glassware, kymographs, pharmacological apparatus, post-mortem instruments, filters, destructors, refrigerators, balances, dissecting cases, epidiascopes, polarimeters, colorimeters, refractometers, and thermostats—amongst many other subjects.

Anyone equipping a laboratory in India would do well to write for a copy of this catalogue. It is profusely illustrated, admirably published, and deals with reliable apparatus only.

### PARKE, DAVIS & CO'S INDEX OF THERAPEUTICS AND MATERIA MEDICA, 1930-1932.

MESSRS. PARKE, DAVIS & Co., Lloyd Building, Graham Road, Ballard Estate (P. O. Box 88), Bombay, have asked us to bring to the notice of our readers the recent

issue of a new edition of their *Index of Therapeutics and Materia Medica* for 1930-1932. This is a very well got-up booklet of 122 pages, and is well indexed. It deals first in alphabetical order with the treatment of different diseases; followed by a classified index of remedies. "Aids to Memory" is a most useful section. Then follows a list of the special preparations of Parke, Davis & Co., with blank pages for personal notes.

Special new preparations noted in the new edition are; "Emplets," which are specially coated gland tablets for oral administration, designed to pass through the stomach unchanged and to dissolve in the small intestine; liver extract vials; "Adrephine," a combination of adrenalin and ephedrine for use as a nasal spray; and anti-streptococcus serum for puerperal septicæmia, a concentrated and refined serum for prophylaxis against or treatment of puerperal septicæmia.

Messrs. Parke, Davis & Co., Bombay, will be glad to supply copies of the new edition to registered medical practitioners on application.

#### "NORMACOL"—A NEW FLAVOURING.

THE manufacturers of "Normacol," the well known intestinal evacuant, ask us to state that this preparation is now issued with a greatly improved flavour, acceptable to the most fastidious palate. The price remains the same as before.

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WE have recently received from Messrs. Watson & Sons (Electro-Medical), Ltd., Sunic House, 43, Parker Street, Kingsway, London, W.C. 2, a copy of a brochure recently issued by them dealing with X-ray couches, screening stands, tube stands, etc. This will be of interest to radiologists in India, who would do well to write for a copy.

A pamphlet also recently issued by the same firm describes their "Sunic" surgical diathermy apparatus. The following is an abstract from this pamphlet describing the "Sunic" outfit:—

A particular type of high-frequency current is necessary for diathermy, and special apparatus is required for its production. Moreover, it has been found that the apparatus which gives the highest efficiency in medical diathermy is not the most suitable for surgical purposes, and that the best results in surgery can only be achieved with a specially designed equipment.

The "Sunic" Surgical Diathermy Apparatus has, therefore, been designed expressly to yield that form of current which has proved most suitable for clean, rapid cutting and surface cauterisation without charring.

Its components are similar to those of the usual medical diathermy apparatus, a high-tension transformer for raising the voltage of the supply current as required, and an arrangement of condenser, spark gap and inductance to produce the desired form of high-frequency current. This apparatus is contained in a convenient cabinet measuring  $13 \times 9 \times 12$  in., and as the complete equipment weighs only 42 lb., it can be conveniently transported and used, if necessary, in the patient's own home.

It operates on any alternating current lighting or power circuit, and a two-pin plug and length of flexible cable are provided. When only direct current is available a rotary converter is necessary. Convenient controls are provided so that cutting currents suitable for any type of operation can be secured with the utmost ease. A footswitch is also included in the equipment by means of which the supply current can be controlled, thus leaving both hands entirely free for manipulation of patient and electrode. Needle point electrodes are

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The outstanding feature of the "Sunic" Surgical Diathermy Apparatus is its reliability and range of control. No electrical knowledge is necessary for its operation, and it yields intensity sufficient for any operation without charring of the surrounding tissues.

"Sunic" Surgical Diathermy Apparatus complete for use on any alternating current supply, with two-pin plug and length of flexible cable, footswitch, one set of 4-needle and 4-edge electrodes, one indifferent electrode  $8 \times 4$  in., one electrode handle, and one pair of electrode cables.

Dimensions .. ..  $13 \times 9 \times 12$  in.

Weight .. .. Approx. 42 lb.

Cat. No. CI/41 .. .. £55

Rotary Converter for use when only direct current is available.

Cat. No. CI/42 .. .. £20

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## Original Articles.

### A STUDY OF YAWS IN KHETRI AREA, KAMRUP, ASSAM.

By SUB-ASSISTANT SURGEON NEPAL CHANDRA DEY,  
Public Health Department, Assam.

THERE has been much discussion in past years as to whether yaws and syphilis are one and the same disease. My aim in this paper is not to enter into the controversy but to record some observed facts in a series of cases detected and treated by me, and leave the readers to form conclusions for themselves. The following is an important point in the differential diagnosis. Parents suffering from yaws have healthy issue without any of the congenital "Hutchinson's trio," and further their children do not show inherited immunity as is proved by subsequent infection of these children from their parents. I have had the opportunity of studying this in an endemic area where yaws has prevailed for the last thirty years or more and where both the parents have suffered, and the children have been subsequently infected.

The diagnosis of yaws in these cases has been established by the finding of *Treponema pertenue* in the lesions. An accurate and detailed description of various manifestations would entail much work and it would be impossible to deal fully with the differential diagnosis of some forms of the conditions presented in this paper. I am therefore giving here the briefest possible general notes on those cases, and use definitely recognised terms to shorten my descriptions of certain lesions and stages of the disease. I attach photographs of some conditions which explain themselves, without much description.

While on village kala-azar survey work, one case drew my attention. I had reason to suspect the secondary eruptions to be syphilitic condylomata, though the patient neither gave any history of primary infection nor were any scars visible in the genitalia. Further points against syphilis were that condylomatous growths were plentiful all over the body, unlike syphilis. Syphilis, in my short experience in Assam for more than six years, is very rarely found amongst the Mikirs and the Lalungs, though they suffer from various other skin diseases.

On taking the history, the patient told me that almost all the members of his family had been suffering from this disease and his daughter, about 8 years old, got the infection first.

Further, he mentioned that the village was originally free from the disease until one infected person settled there on marriage, and

the infection spread rapidly in that and neighbouring villages. The fact that the child was infected first led me to examine slides for yaws, and *T. pertenue* was found in the smears of a few cases. This confirmed my diagnosis of the disease to be yaws or *Dumarukhahu* in their vernacular. This literally means *dumaru*—a fig, and *khahu*—an eruption or exanthem. The secondary eruptions, after the nodules break, look like a ripe burst fig, and to this the name is due. Thus it resembles the Latin name *frambesia*—a raspberry.

Khetri area is badly infected with yaws. It is prevalent amongst the aboriginal tribes—the Mikirs and the Lalungs—especially amongst those settled in the villages in the border line of Nowgong and Kamrup districts. These villages are all situated along the foot of the Khasi and Mikir Hills and have usually a single streamlet running through many villages, which is used for bathing, washing and drinking purposes.

The number of cases diagnosed in the course of my kala-azar survey during the last nine months is 269. These represent a small proportion only of the total number of cases and are only those who presented themselves for the treatment of skin and other lesions in the dispensary or in the villages.

From the history of the cases the disease can be traced in this generation for at least 35 years and during the last 5 years it has been spreading rapidly.\* Enquiry reveals that at some time or other almost all the people of the village suffered from some form of this disease, slight or severe; in support of this I can say that a control serum for the Kahn test often misled me and when found positive, after thorough enquiry, the patient gave a history of this disease.

Generally speaking, there is evidence here that persons staying in the infected villages for a period get the infection. Or if an infected person from a distant village emigrates, settles and in most instances marries in a particular village, the disease spreads in that particular family and later on in the village, originally free from infection. Thus one can account for the spread of infection by direct contact.

Filthy and unhygienic habits surely favour the spread of infection. On the contrary, people of adjacent villages with better sanitary habits and without much contact with infected people (as in the case of a Mahommadan non-infected village and an infected Lalung village) remain free from it. Thus Mahommadans of a village on the other side of the road to a

\*From recent reports of the prevalence of yaws in Northern Burma, the Chittagong Hill Tracts, and different parts of Assam, it looks as if yaws will be the next epidemic disease with which the public health authorities in these areas will have to deal. Dr. Muir—in connection with leprosy surveys—has also discovered the prevalence of yaws in Singhbhum district on the Bihar-Bengal border line.—Editor, *J. M. G.*



badly infected Lalung village are free from infection, perhaps because there is no contact, due to caste distinction.

Most of the cases give a history of some injury, cut, abrasion, thorn prick, ulcer from a burn or other cause, or a leech bite at the site of primary sore. The sites of primary infection among 200 patients out of a total of 269 who could give a definite history are as follows:—

Leg ..	.. 139 or	69.50%	of the total number.
Trunk ..	.. 16 or	8.00%	" "
Hand ..	.. 23 or	11.50%	" "
Face ..	.. 3 or	1.50%	" "
Genitalia ..	.. 2 or	1.00%	" "
Scrotum ..	.. 4 or	2.00%	" "
Inguinal region ..	.. 3 or	1.50%	" "
Buttock ..	.. 7 or	3.50%	" "
Neck ..	.. 2 or	1.00%	" "
Head ..	.. 1 or	0.05%	" "

It is evident that the legs and hands, being most exposed to cuts, abrasions or ulcers from various causes, are the commonest sites for primary infection.

Yaws in Assam is a disease of tropical damp areas at the foot of hills. In the rainy season the disease appears to assume an epidemic form. If one were to look for the insect transmitter of the disease, one would think of eye flies of the genus *Siphunculina*. These eye flies, which are as fond as house flies of sucking the secretions of ulcers or abrasions, abound in this area in the rains and might play an important part in the transmission of the disease, carrying secretions of yaws lesions to abraded skin surfaces or to ulcers of otherwise healthy persons. Once I saw an ulcer of two years' duration on the leg which I suspected to be a healing Naga sore but the patient on the next visit to the village after a month showed pea-like secondary eruptions of yaws around the ulcer with typical yellow scabs.

Contaminated pools of water might also be held responsible. Many people wash at the same pool, often on the stones on which clothes are washed by all.

Of 269 cases 224 were adults and the remaining 45 were children below 10 years of age. But many of the adult cases gave a history of infection in childhood.

The inhabitants of the affected locality believe that the disease spreads at the time of the germination of new bamboo plants which they eat. This is perhaps because the monsoon starts at that time and the disease spreads rapidly or reappears from its latent stage during the monsoon.

Of 269 cases 9 were in the primary stage of the disease and all were extragenital. The proximal lymph glands receiving the drainage of the affected part were enlarged in all these cases. Of these 269 cases 2 gave a history of a primary sore in the external genital parts. Both were females and examination for the scar or the sore was not possible. One of these got the infection from a secondary sore on the

scrotum of her husband and the other was a virgin who contracted it by nursing and washing the sore of her brother. Mother yaws or *maika khahu* as they call a primary sore, is single in the beginning. But from direct contact of secretion there may be several before the generalised secondary eruptions appear, and the original sore has been found to continue for years together even after the subsidence of secondary sores without treatment. In a mixed treated case, the primary sore is more resistant than the secondary ones.

Most of the cases in the series were found with secondary eruptions over the whole body, and in a fair number in children in whom late secondary symptoms are rare. On the contrary in elderly people the early secondary eruptions subside rapidly. This is probably due to the use of a country drug *singrup* (red oxide of mercury) which they smoke to abort the disease. Subsequently these cases have the eruptions limited to their palms and soles only, resulting in cracks and pits from exfoliation of the skin, and also premature falling out of the teeth. These cases are very amenable to treatment.

Even when this drug is not taken, there is a tendency for the disease to be limited to the palms and soles sooner or later, resulting in many cases in cracks resembling syphilitic hyperkeratosis or pits like keratoderma *cribrata* (Castellani), and in these positions such lesions have been found to continue even up to thirty years without tertiary symptoms. This is really a condition like syphilitic psoriasis, but secondary frambœsides often appear in these sites at variable intervals. I classify these lesions of the hand and feet as manifestations of the late secondary stage.

The perineum in children and axillæ in adults, being moist areas, are sites where the eruptions persist after disappearing from other parts of the body.

Some of the cases show a tendency for the sores to be limited to the legs and soles of the feet only, without being generalised, and in a few cases secondary eruptions early in the disease have been found only round the primary sore.

A squamous type of the disease is common in early secondary cases. It is seen in furfuraceous, whitish patches of round, oval or irregular shapes about the size of a rupee or smaller. They are symmetrical as a rule. The desquamation may precede but often follows the appearance of a group of papules which after a variable time become hard, burst and form a typical frambœside.

Coppery spots preceding the secondary eruptions on the palms have been noticed in some cases. They are often oval in shape but may have an irregular outline. They persist after the disappearance of eruptions and permanently stain the tissue. Further, a bronze coloured pigmentation takes place around the



Fig. 1.—A case with secondary condylomatous eruptions and circinate ulcers.



Fig. 7.—Rupia-like ulcer with a thick yellow scab (a tertiary affection).



Fig. 4.—A case with tertiary bony affections. Note the bending of tibia and matting of all the bony parts of the palm of left hand and thinning and deformity of fingers of right hand. There is ankylosis of joints due to disuse of the part from pain.

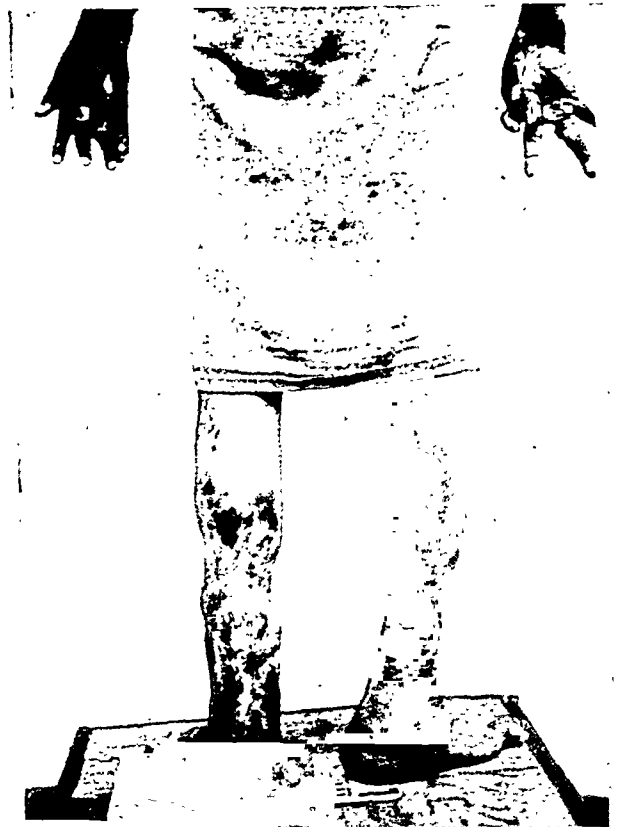


Fig. 8.—Deformities of fingers from tertiary affections and tertiary ulcers of legs.



Fig. 5.—Secondary eruptions on face and axillae.



Fig. 6.—Tertiary ulcers over the knee joints.  
Mark the scar over the right knee cap.



Fig. 9.—Tertiary nodes of tibia and radius.



Fig. 16.—Leucoderma-like patches from yaws.

secondary lesions on the front and back of wrists, the dorsum of the ankle joints, the hands, and nape of the neck. The skin of the affected part hypertrophies and is thrown into folds due to hyperplasia of the papillae. Desquamating patches as a result of scratching are found in these parts.

A rheumatic pain all over the body in the late secondary period, causing flexion of all joints and subsequent invalidism, though rare, has been noted.

Affections of the eye with iritis and keratitis have been found in some cases. Epidemic conjunctivitis is common in the area and affections therefrom have not been excluded.

The general health is almost invariably interfered with in the acute stage of the disease and the treatment with salvarsan gives a glazed appearance of the skin with marked improvement of general health.

Circinate ulcers with thin yellow scabs (Plate I, fig. 1), though comparatively rare, have been found in 3 cases. When naturally cured the scars of these ulcers have a tendency to form keloid scars.

Secondary sores are generally few or even become latent in the winter months without treatment.

Tertiary manifestations (18.5 per cent. of the total cases), chiefly ulcers from gummatous affections of skin, are common (9.25 per cent. of the total cases and 50 per cent. of the tertiary cases) in the affected area. Primarily, a thickened fibrous nodule appears under the skin which subsequently caseates and forms a deep seated ulcer. At first sight they seem to be indolent ulcers continuing for years together with involvement of the underlying bones, causing deformities. The affected part gets thinner, and irregular in contour from abrupt depressions from the thinning of the bones and deep fibrous scars upon them (Plate I, fig. 2). After serious deformities result from contracture of muscles. Thus when one passes along this part of the Assam trunk road people limping from deformities are often seen. Yaws is responsible for most of these. These ulcers mostly appear in relation to joints and are covered with thin yellow scabs as a rule, but a condition like the rupia or ecthyma of syphilis with conically raised thick yellow scabs is often noticed. The tertiary ulcers may heal up of themselves but more ulcers may crop up afresh. Bones are often affected when the infection finds a chance to go deeper.

The difference between the scars of secondary sores and tertiary ulcers is the deposit of pigment in the former and absence of any pigment whatsoever in the latter. In the latter lesions, the area is like a big patch of leucoderma which takes a long time to get pigmented. Scars like burns on the forearms from tertiary ulcers have been observed, and these scars with adhesions cause deformity and consequent loss of use of the part. This often results

from serpiginous ulcers, and in a case of twenty years' duration ulcers with thick white crusts about the size of a four anna silver bit and a raw surface underneath (the pseudo-mycetoma of Castellani) have been found in the margin of those scars. These ulcers go on affecting the healthy skin, leaving a scar tissue behind (Plate IV, fig. 17).

Nasopharyngeal and nervous affections are rare, but two of each type have been observed. The nasopharyngeal type (Plate III, fig. 12) is exactly like that of gangosa and I have every reason to believe that conditions exactly similar to gangosa may be sequelae of tertiary yaws of long duration, affecting the nasopharynx.

In one of the nervous cases, loss of the knee jerk, Argyll-Robertson pupil, impaired vision and Romberg's sign were present with affection of the speech and paresis of the left side of the body. In the other, a condition like acute transverse myelitis of the lumbo-sacral region was found. The symptoms of yaws had been latent for four years and the patient was otherwise healthy. The disease was ushered in with sudden acute radiating shooting pain in the legs, making the patient unable to stand without a support. This was followed within a week by paraplegia. The tendon reflexes were lost with a flaccid type of paralysis. There was incontinence of urine and faeces. Trophic changes followed very quickly and the patient died of intercurrent pneumonia. In these two cases there was no history of syphilis, nor was there evidence of any healed lesions and the Kahn test was definitely positive. This is a matter of great interest as it is probably not recognised (except the cases of Harper in the Fiji islands) that conditions in every way resembling neuro-syphilis (tabes dorsalis and general paralysis) may result from yaws.

Gummatous affections of long bones, especially of the tibia and radius, with formation of nodules like those of syphilis and dactylitis are not rare (20 per cent. of tertiary cases and 3.7 per cent. of the total cases). Generally, thickening and hypertrophy of the periosteum of one tibia occurs with engorgement of the veins. In a few cases the fingers are thinned out, due to atrophy and thinning of bones.

As regards other tertiary manifestations, juxta-articular cartilaginous nodules under the skin (1.5 per cent. of the total cases and 8 per cent. of the tertiary cases), hyperpigmentation and leucoderma-like patches of the palms and soles (1.85 per cent. of the total cases and 10 per cent. of the tertiary cases), were also seen.

Subcutaneous juxta-articular nodules are fibrous growths of pyramidal shape giving a cartilaginous feel under the skin. They tend to appear on the bony prominences, generally over the lateral malleolus, the knee cap and the extensor surface of the elbow joints. In one case small nodules have been found on the palms—near the metacarpophalangeal joints. This is a late manifestation in yaws, two years

being the minimum period of its appearance after the primary sore in the series. It is a sign which helped me in detecting latent cases of yaws in people who denied any infection. When cross-examined, they gave a history of the disease in some part of their life, and either the Kahn or Wassermann tests or both the tests were positive in all these cases. They responded to a combined treatment with potassium iodide and salvarsan.

Leucoderma-like patches are brownish white in colour and give a honeycomb appearance in the beginning by encircling naturally pigmented areas of healthy skin. They start about 10 or 12 years after the patient is free from evident disease elsewhere. Though they simulate syphilitic leucoderma in appearance, this is a very late manifestation in yaws. The skin is otherwise healthy except for the depigmentation, but a slight amount of hyperkeratosis is found in some cases. These patches extend from the palmar aspects of the palms and plantar aspects of the soles and affect subsequently the pigmented dorsal aspects. The clefts of the fingers and toes become affected also. They are symmetrical as a rule and are found in bands round the feet and palms. Isolated patches are also seen along with them on the dorsal aspects. These patches have been distinguished from the depigmented scars of tertiary ulcers.

The above condition and hyperpigmentation of skin are classed as late cutaneous manifestations. In one case in the series hyperpigmentation was found with a uniform dark pigmentation of the whole palms. This started several years after the man had had the primary sore.

Another late cutaneous affection is a generalised psoriasis-like condition of the whole body with exfoliation of thick crusty scales resembling dermatitis exfoliativa (Plate II, fig. 10).

From a serological study of the cases the following summary may be given (Table I).

Out of 12 negative Wassermann tests 7 were latent cases and 5 were cases of long duration.

A comparative result of the Wassermann and Kahn tests in latent cases whose sera were examined is given in Table II.

The principle of taking the same sera for both the tests was observed throughout.

Out of 231 sera, including those 141 cases in Table I, all were positive for the Kahn test (standard method), thus giving a cent. per cent. positive result. A case as early as two weeks after the appearance of the primary sore has given a positive result.

A single injection of an arsphenamine product may make a strongly positive Wassermann reaction doubtful or negative, but a Kahn test even six months after a person is free from any symptoms and apparently cured from the disease after injection shows very little deviation towards the negative side. In most of the cases there is only an insignificant decrease in the intensity of the positive reaction.

The discovery of salvarsan by Ehrlich was a therapeutic triumph against spirochetal and other allied diseases, and one cannot but be delighted to see the miraculous effects of the drug in yaws of twenty or even thirty years' duration with active late secondary lesions controlled by a single dose. The drug is even more efficacious in yaws than in syphilis.

Myosalvarsan and neosalvarsan were the drugs used by me in this series of cases. The former is almost as good a specific as neosalvarsan, with the added advantage of safety and greater ease in the administration of a comparatively bigger dose. With experience in intravenous therapy for more than five years in kala-azar centres, I could not but appreciate the ease of pushing it in restless children in bigger doses than neosalvarsan with very little or no toxæmic reactions, such as temporary loss of vision, intestinal cramps, purging, vomiting, fever, etc. The maximum single dose for an adult varied from 0.45 to 0.60 grm. keeping in

TABLE I.

Total number of sera.	Kind of test.	No. anticomplementary or otherwise unsuitable for the test.	Number of sera tested.					Total positive.	Total doubtful.		Total negative.	Total doubtful and negative.
				++++	+++	++	+		(±)	(±±)		
141	Wassermann test.	* 11	130	*	37 28.46%	59 45.28%	13 10%	109 83.85%	8 6.15%	1 0.77%	12 9.23%	21 16.15%
130	Kahn test	Nil	130	73	32	18	7	130	..	..	..	..
* 11	Kahn test	Nil	* 11	6	5	..	..	* 11	..	..	..	..
KAHN TEST TOTAL ..			141	79 56.03%	37 26.24%	18 12.77%	7 4.96%	141 100%	Nil	Nil.	Nil	Nil

\* This column is meant only for Kahn test.



Fig. 11.—Dactylitis and deformities of fingers (tertiary affection).



Fig. 12.—Affections like gangosa due to nasopharyngeal involvement.

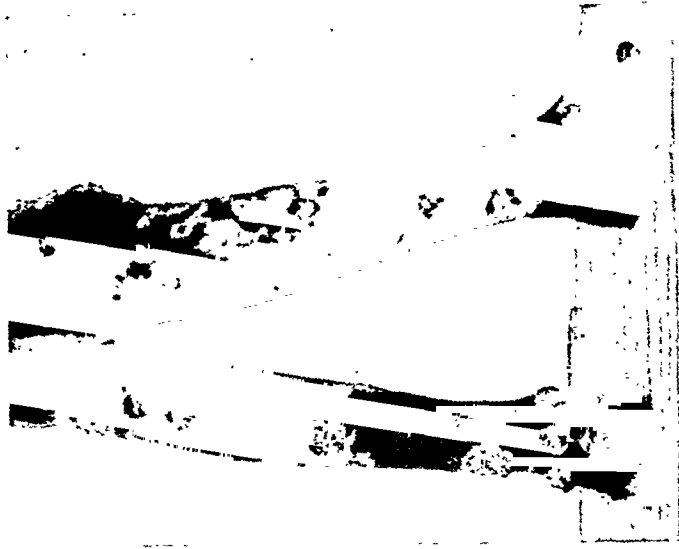


Fig. 2.—Generalised secondary eruptions with warty scabs. Note the scar of primary sore on right leg.



Fig. 3.—Secondary sores on soles of feet.



Fig. 19.—Condition like Raynaud's disease from yaws in a case complicated with ankylostomiasis (a tertiary affection).



Fig. 18.—Dactylitis of fingers. Mark the shortening of the middle finger of right hand due to the affection.





Fig. 13.—Three subcutaneous juxta-articular nodules.

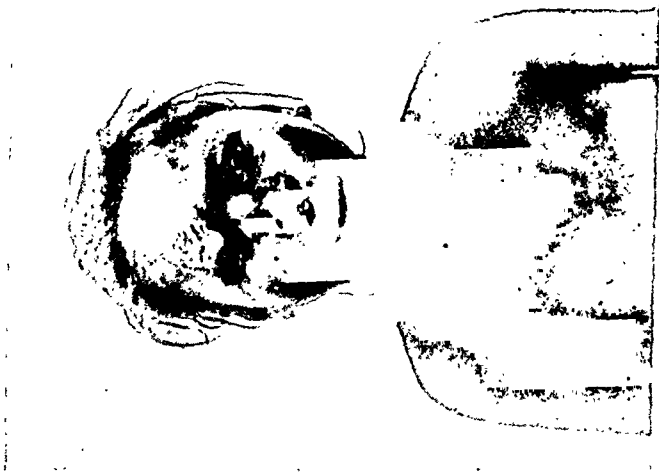


Fig. 14.—A primary sore of one month's duration.



Fig. 17.—Deformities from adhesions of tertiary ulcers. The arm shows ulcers with crusty white scabs. They are of serpiginous nature.



Fig. 10.—Generalised psoriasis from yaws resembling dermatitis exfoliativa with thick white crusty scales and adhesions from scars of tertiary ulcers.



Fig. 15.—A group of yaws cases from a village of 20 houses. Note the intensity of infection from the number of patients. (From Dr. H. A. H. D'Silva of the Kalia-yaws Commission.)

TABLE II.

Kind of test.	Total cases.	Sera anticomplementary or otherwise unsuitable for the test.	++++	+++	++	+	Total positive.	Total negative.
Wassermann test	9	1	2	2	1	3	1	7
Kahn test ..	9	Nil	2	2	2	3	9	Nil.

view the acuteness of the disease, age, sex, height and weight of the individual subject. Children of 2 years or below could stand as much as 0.125 grm. as a single maximum, initial dose; whereas the same dose of neosalvarsan was not administered without the danger of a severe reaction. An additional advantage is the smaller amount of diluent required, either distilled water or 10 per cent. glucose solution in water; 2 c.c. of the latter makes an isotonic solution with 0.60 grm. of myosalvarsan. Considering these and other advantages, I encouraged the use of the drug in treating cases along with my survey duty. The only drawback in its use is the pain which persists for about 3 days after injection. Severe itching all over the body persisted in some cases, as in the case of neosalvarsan.

The injections were given into the deltoid, as it was not convenient to administer them into the gluteal region either in the village or in outcentre work.

Sulfoxyl-salvarsan, a ready made solution, was administered in some cases. Baermann in Sumatra has used it to a great extent but it is too early to pass any remarks on it, and my limited experience forecasts that the use of the drug which is mainly meant for parasymphilitic diseases, should be limited to cases of frambœsia. Neo- and myo-salvarsan are decidedly more potent and effective in acute lesions than sulfoxyl-salvarsan.

The results of cases treated with myo- and neo-salvarsan were as follows:—

begin to heal up within a week after the first injection. As a rule one to two injections are necessary in an average case. In a few exceptional cases as in children, who resist treatment more than adults, 3, 4, or more injections were necessary to get the eruptions to subside completely, and even then relapses amongst them were not uncommon. Late secondary cases with psoriasis and hypertrophy of the palms and soles respond more easily and quickly than early secondary ones. Patients smoking the country drug generally show all signs of a cure after a single injection. The efficacy in late secondary cases may be ascribed to this practice. Generalised secondary eruptions are more amenable to treatment than is the primary sore in a mixed case, and the latter generally persists after the subsidence of the secondary lesions.

Relapses after partial treatment with salvarsan have been observed in some cases. After a single injection when the eruptions subside, the patient discontinues to attend and at intervals develops successive crops of eruptions which tend to disappear spontaneously without further treatment. The eruptions are not of the original fungoid nature, but are flat ulcers with a scab indistinguishable from ordinary ulcers.

Patients having intercurrent diseases, especially malaria with enlargement of the spleen, require a protracted course and this may be the reason why children, who possess the least amount of immunity to malaria, resisted and showed relapses. As a few kala-azar cases

	Single injection.	Two injections.	Three injections.	More than three injections.
Myosalvarsan .. ..	73 or 84.88%	11 or 11.63%	2 or 2.33%	* 1 or 1.16%
Neosalvarsan .. ..	55 or 94.83%	2 or 3.45%	1 or 1.72%	Nil.
Combined both myo- and neo-salvarsan. ....		* 6 or 40.00%	* 4 or 26.66%	* 5 or 3.33%

\* These were really very bad cases and a few of them could not tolerate neosalvarsan, and small doses of myo-salvarsan were administered.

One injection of myosalvarsan or neosalvarsan in 0.45 or 0.60 grm. dose is enough to apparently cure a case of primary sore. The ulcer continues to heal up steadily without any further attention or antiseptic dressings.

Early secondary symptoms such as condylomatous or warty sores, get flattened out and

with secondary frambœsides have been treated with urea stibamine for the former disease without any effect whatsoever on the latter, it can safely be concluded that this drug has no action on the causative Treponema, but these cases appear to be cured after a single injection of myo- or neo-salvarsan.

Castellani's mixture has not been tried sufficiently to form an opinion, but it is an invaluable remedy for the pain specially noticed in some cases either before or after injection. Severe rheumatic pains in the course of the disease respond to salvarsan combined with Castellani's mixture.

Big tertiary ulcers resembling Naga sores respond readily to treatment. These may heal up with 2 or 3 injections without antiseptic dressing. Generally the margin of a tertiary ulcer, as also secondary eruptions, while healing, show a pigmented zone round them; the secretion becomes less and a scale forms which falls off subsequently, leaving a depigmented scar tissue. These areas, after restored pigmentation, appear as smooth, glazed, shining surfaces, like those of burns or scars and are quite distinct from healthy skin. Even when after giving injections once a week for 3 or 4 weeks the injections are stopped, the ulcers show a tendency to heal up of themselves without any antiseptic care.

Bony involvements, including dactylitis are efficiently treated with 2 or 3 injections.

One nervous case (showing signs like tabes dorsalis) treated, improved marvellously after 3 injections of myosalvarsan and has gradually got better since then. Romberg's sign has disappeared, the eyesight has improved, the strength of the limbs came back and the patient is brighter and more active than before.

The general health improved a great deal in all cases after a cure.

Ankylostomiasis seriously complicates the disease.

In conclusion, I have to express my grateful thanks to Lieut.-Colonel J. Morison, I.M.S.,

Director of the Pasteur and Medical Research Institute, Shillong, for very kindly furnishing me with the results of the Wassermann reactions of the sera sent to the Institute. His help and encouragement have been at the back of all my work.

I am also greatly indebted to Lieut.-Colonel J. F. James, I.M.S., Civil Surgeon, Kamrup, for his kind permission to publish these notes, and to Rai Bahadur Dr. N. P. Neogi, the then Civil Surgeon, Kamrup, for kindly allowing me to treat these cases.

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### A NOTE ON CANCER AND RADIUM IN SOUTH INDIA.

(BEING PART OF THE ANNUAL REPORT OF THE  
MADRAS GOVERNMENT GENERAL HOSPITAL,  
1929.)

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#### Cancer.

THE following table shows the number of patients (411) suffering from malignant disease admitted in the General Hospital, Madras, during the year 1929.

#### Malignant cases.

Total 411.

Myeloma. 1	Sarcoma. 41	Rodent ulcer. (Ear.) 2	Carcinoma. 367.
	<i>Classification.</i>		<i>Classification.</i>
	Melanotic 3		Malignant tumour of abdomen, not classified 9
	Bones 10 (Femur 6)		Malignant glands, primary growth not noted.. 6
	Others 28		Breast .. .. 42
	41		Larynx .. .. 8
			Stomach .. .. 16
			Cheek and jaw .. .. 143
			Tongue .. .. 44
			Tonsils .. .. 4
			Œsophagus .. .. 4
			Rectum .. .. 25
			Liver .. .. 4
			Penis .. .. 27
			Cervix uteri .. .. 8*
			Other situations .. .. 24
			Cutaneous .. .. 3
			TOTAL .. 367

\* Gynæcology patients usually go to the special hospitals.

The knowledge of the existence of radium at the General Hospital has undoubtedly attracted a large number of these patients, and the statistics bear out, what has been reported before, that the incidence of malignant disease is very much the same in South India as it is in other parts of the world. Formerly we have commented on the comparative rarity of cancer of the breast, but during the past year this belief has been upset and suggests that there is a tendency for women to conceal the disease. One patient admitted to a medical ward was found quite by accident to have an old cancer of the breast which has been treated, apparently successfully, with radium.

The following table shows the effects of radium treatment.

	Cleared.	Improved.	Increased.	Died.	No report.	Total.	
Cheek ..	2	3	3	..	14	22	
Tongue ..	2	3	..	..	2	7	
Tongue and floor of mouth.	1	..	..	..	1	2	
Floor of mouth ..	..	..	..	1	1	2	
Sarcoma ..	..	1*	..	..	1	2	* Chest wall.
Palate ..	..	..	..	1	..	1*	* At first much improved.
External ear ..	..	1	..	..	..	1	
Breast ..	1	3	..	4	4	12	
Parotid ..	2	..	..	..	..	2*	* One was recurrent endothelioma. One had radium implantation after excision and is free after 21 months.
Larynx ..	..	..	..	1	..	1*	* Teletherapy.
Cervix uteri ..	..	..	..	..	1	1	
Penis ..	..	1	..	1*	1	3	* During treatment.
Œsophagus ..	..	..	..	2*	..	2	* 1 teletherapy, 1 cavitary method—no improvement.
Nasopharyngeal sarcoma.	..	1	..	..	..	1	
Nose ..	..	2*	1	..	..	3	* Both sarcoma.
Meninges ..	..	1*	1	1	..	3	* Adenocarcinoma—recent case—very great improvement.
Rectum ..	1	..	..	1	2*	4	* Both relieved of pain when in hospital.
	9	16	5	12	27	69	

Except when stated all are cases of carcinoma. Except in the œsophagus all were confirmed by microscopic examination.

These figures are obviously of no value as an estimation of final cure, and although they mainly refer to patients treated since my return from leave in August 1929, they are not entirely discouraging. In 9 patients classed as cleared, no evidence of cancer could be found several months after cessation of treatment. Two of these had had fairly extensive cancer of the cheek, a disease in which our operative results have always been appalling. Radium caused diminution of pain in several patients shown in columns 3 and 4, but cases shown as improved are only those in whom, from their condition when last seen, we are hopeful of the disease clearing. Follow-up attempts have always been disappointing and it is unfortunate

that we already seem to have lost touch with some of these patients.

Of the several methods of applying radium, interstitial implantations and surface application, with prepared paste, gave the best results, and our technique does not differ from that described by several recent writers. During two periods we tried a modified teletherapy, 250 mgms. of radium, most of our supply, being collected into a packet, or bomb, and patients submitted to distance irradiation at 10 cms. from the skin for 4 hours daily, spread over a period of 14 days. Each patient thus received a dose of 14 gr. hours. Captain Barnard, the Radiologist, invented a very ingenious apparatus with lead screening for this treatment. One patient with recurrent

endothelioma of the parotid was very much improved and after further surface application is apparently cured, but results with the remaining patients were not encouraging, and with our limited supply of radium (330 mgms.) the method of distance irradiation is not economical. The experiment is not worth repeating unless a large supply of radium can be placed at our disposal.

The best results are undoubtedly obtained in cancer of the breast, tongue and floor of the mouth, and we have entirely abandoned operative treatment for malignant disease of the tongue. Our results are really more promising than is shown in cancer of the breast, for in two patients who died, the original breast cancer

had entirely melted away, and one of these, an old lady of 70, died from a secondary deposit in the spine without any of the distressing symptoms usually associated with cancer.

The case with adenocarcinoma of the meninges who improved is worth recording. An operation elsewhere, for what appeared to be a sebaceous cyst in the scalp, resulted in alarming bleeding and the patient was hurried to the hospital. Hæmorrhage from a tumour, adenocarcinoma in character, which had eroded the skull in the frontal region was stopped by use of the actual cautery. At a later date the patient was given 120 mgms. of radium element as a surface application for 8 days, total dose 9,648 mgm. hours. The result has been remarkable, and when last seen 6 weeks after treatment, there was every appearance of the growth "melting away."

Cancer of the cheek, with its spread to the mandible or maxilla, still remains our greatest problem, and the impression gained by a study of 22 cases during the past year is that if we can evolve a suitable radium technique and can see the patients early enough the disease in this region can be dealt with. In many years' experience of this disease in South India I have seen very few patients cured by operative methods. The remarkable effect on an ulcerative leucoplakic condition which follows removal of the teeth, leads me sometimes to wonder whether even some of these successful results when unconfirmed by microscopic examination were really cases of cancer. Cancer of the cheek though often slow growing, once it has invaded the muscle, spreads far and insidiously and it would seem that it is this muscle spread which is difficult to control and effectively to bombard with our rays. Two patients returned with an extension of the growth although the centre and main tumour which had been well irradiated then appeared soft and free. Our method has been to implant the radium needles throughout and around the obvious growth, making as effective a pattern as possible and to retain them for at least 8 days. The needles have been secured in position by sutures or by the method of retrograde needling, one end of the thread being drawn through the mouth and, after knotting to the outside end, fixed to the cheek by strapping. Duration of radiation appears to have been of more importance than massive dosage, the larger doses, in needles of 2 to 5 mgms. and in some cases running up to a total of 8,000 mgm. hours and which we have been compelled to use by limitations of supply and needle strength, seem to have been responsible for the necrosis which has occasionally occurred. The method we propose to aim at is a number of small needles containing 0.6 to 1 mgm. of radium carefully distributed over the growth. In successful cases the ulcerated

mucous membrane often becomes covered by a thin yellowish fibrinous deposit and in a few weeks the area again becomes soft and pliable. Superficial necrosis of the jaw occurred in two cases, but it is a risk that must be taken. Both appeared to be superficial and could be dealt with easily by ordinary methods. The radiated area also loses its pigment. Fortunately the glands are affected late in cancer of the cheek, but otherwise in our experience the disease is far more resistant to radium than is cancer of the tongue or floor of mouth.

Nine patients, suffering from inoperable malignant disease, for whom it was considered that neither operation nor radium offered any hope, have been treated by my Registrar, Dr. Narasimham, with lead selenide. The solution (Todd's D.4 S) was obtained from the British Drug Houses, Ltd. In all these patients the drug appeared to relieve the pain, but in only two was any noticeable effect observed on the size of the growth. Case No. 4 improved in a remarkable way and a large sarcoma of the thigh practically disappeared under treatment. The patient died three weeks after leaving hospital, apparently from very severe anæmia which had increased rapidly during treatment and which failed to yield to treatment with liver extract and blood transfusion. Another patient No. 5 left hospital with no visible sign of tumour, a result due to diathermy cauterisation and possibly assisted by lead selenide injections. Unfortunately this patient could not be traced.

### PLANTAGO OVATA—ISPAGHUL—IN CHRONIC DIARRHŒAS AND DYSEN- TERIES.

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*Introductory.*—The genus *Plantago* comprises about 50 species of which ten are natives of India. A number of these herbs have been used in the indigenous medicine for many centuries. *P. ovata*, Forsk. or *P. ispaghula* is known in Hindi as *Ispaghul*, *Isbaghol*, *Isabghul* or *Issufgul*; in Arabic it is called *Bazre-quatuna* or *Bazre-katuna*; and in Persian *Ispaghul* and *Shikam daridah*. Although it is not mentioned by the ancient writers of Hindu medicine it is known in Sanskrit as *Sringdhajeera*. This herb is found growing in the plains of the Punjab and Sind and in the low hills from the Sutlej westward; it is also cultivated to a small extent in different parts of India such as Bengal, Mysore and the Coromandal coast. Westward it is also distributed to Spain and the Canaries.

The seeds of this plant are boat-shaped, about 1/8th inch long and rather less than 1/16th inch broad. They are translucent and pinkish grey but the colour may vary, some being brown while others are white with a pinkish tinge, the latter being generally preferred. The concave side of the seeds is covered with a thin white membrane. When microscopically examined the epidermis of the seeds is found to be composed of polyhedral cells, the walls of which are thickened by a secondary deposit which is the source of the mucilage. Between it and the albumin is a thin brownish layer; the albumin is formed of thick walled cells which contain granular matter. When soaked in water the seeds become enormously swollen with an abundant coating of adhering mucilage which is free from taste and odour.

The seeds of several other species of the same genus exhibit similar properties. *P. amplexicaulis* is a plant which grows in the plains of the Punjab, Malwa, Sind, extending into Southern Europe. It furnishes the brown *Ispaghul* which is not infrequently met with in the Indian bazars. These seeds have also a boat-shaped appearance like those of *P. ovata* but are rather large, averaging 1/6th inch in length. They produce mucilage in the same way and probably have just as effective demulcent properties as the true *P. ovata* seeds. Large quantities of these seeds are imported into India from Persia.

*P. major*, known as *Luhuriya* in Hindi and *Bartang* or *Barhang* in Persian, is a large herb which is found on the alpine Himalayas from Peshawar and Kashmere to Bhutan at a height of 2,000 to 8,000 feet above the sea-level, as well as in Western Tibet at an altitude of 10,000 to 12,000 feet. It has also been reported to grow in Assam, the Khasia mountains, Burma, Malacca, Singapore, Bombay, the Nilgiri hills and the higher parts of the Sudan. This plant was used in ancient Roman and Greek medicine. The Arabian and Persian writers describe it under the name of *Lisan-el-hamel*. The seeds of *P. major* are imported largely into India from Persia and have the same properties as those of *P. ovata*. They are at the present time largely used in the indigenous medicine in India as a remedy for dysentery.

The seeds are oblong and brown, marked with waves having slightly elevated longitudinal ridges of a dark colour. One side of the seed is arched and the other side is concave and marked with a scar showing the attachment to the ovary. They are insipid and have an oily taste when crushed. When soaked in water they become coated with a thick layer of transparent mucilage resembling *P. ovata*.

Some of the other species of *Plantago* are *P. psyllium* (which is practically the same as *P. major*), *P. brachyphylla* and *P. lanceolata*.

#### USES IN INDIAN INDIGENOUS MEDICINE.

*P. ovata* seeds are not mentioned by the writers of the Hindu medicine and appear to

have been unknown to them. They, along with the seeds of several other species of *Plantago*, were very frequently referred to by Arabian and Persian writers who esteemed them very greatly as medicinal agents. Even as far back as the 10th century the Persian physician Alharvi mentioned them, and a little later Avicena referred to the drug. All the subsequent writers on Mohammedan, medicine have extolled the properties of *Ispaghul*. The seeds were introduced in the Indian medicine by the advent of the Mohammedans and they began to be largely used as a popular remedy in chronic dysentery and intestinal fluxes. Even at the present time they are perhaps the most extensively used remedies for intestinal conditions. Any kind of diarrhoea, especially when blood or mucus is present in stools, is treated by the people with these seeds. They are also considered to be cooling and demulcent and besides their use in diarrhoea, dysentery and other inflammatory and functional derangements of the digestive organs, they are recommended in febrile conditions also. They are said to have diuretic properties and are given in affections of the kidneys, bladder and urethra (gonorrhoea) in doses of 2 to 3 drams, either mixed with sugar or in the form of a decoction. Powdered seeds are frequently mixed with seeds of *Holarrhena antidysenterica* and are given in dysentery. The crushed seeds are made into a poultice and are applied to rheumatic and glandular swellings. A cooling lotion for the head is also prepared from the mucilage; and a decoction of the seeds is prescribed in coughs and colds. A slight degree of astringency is believed to be imparted to the seeds by heating them in a dry condition.

*P. ovata* seeds are frequently mixed with seeds of *Salvid aegyptica* or *Tukhu-malanga*, which also grows in the plains of the Punjab and like *P. ovata* seeds yield a copious mucilage.

#### CHEMICAL COMPOSITION.

The seeds contain a large quantity of mucilage, a fatty oil, and albuminous matter. They yield mucilage in great abundance, 1 part of the seeds with 20 parts of water rapidly forming a tasteless jelly. On addition of a large quantity of water and filtering, little mucilage passes, the majority adhering to the seeds. The mucilage, however, can be separated by straining with pressure. It is neutral in reaction, is not altered by adding or precipitated by boiling with alcohol, nor is it changed by iodine, borax or perchloride of iron. It is only sparingly soluble in water. A glucoside named *Aucubin*  $C_{13}H_{16}O_8$  plus  $H_2O$  has been isolated from the seeds, leaves, root and flower stems of *P. major* and *P. media* and also from the leaves, roots and seeds of *P. lanceolata*. It crystallises in the form of colourless bush-forming needles which have a melting point of  $181^{\circ}C$ . and a rotation in aqueous solution of  $-164.9$  (1.06



per cent.). This glucoside has also been found in *Ocuba japonica* and probably occurs in some of the other plants belonging to the natural order *Plantaginacæ*. Subcutaneous injections of *Aucubin* in guinea-pigs showed it to be entirely non-toxic.

Henry and Brown (1923) examined *P. ovata* along with a number of antidysenteric remedies. The finely ground drug was exhausted with boiling alcohol, the extract concentrated *in vacuo* and the thick syrup diluted with water to precipitate fatty and resinous matters, which formed preparation A. The liquor from this precipitate, after further concentration *in vacuo* to remove all alcohol, constituted preparation B. The latter was then diluted with lead acetate to remove tannin and gum, which after recovering from the lead precipitate gave preparation C; and the residual liquor, after removing the excess of lead added, yielded preparation D.

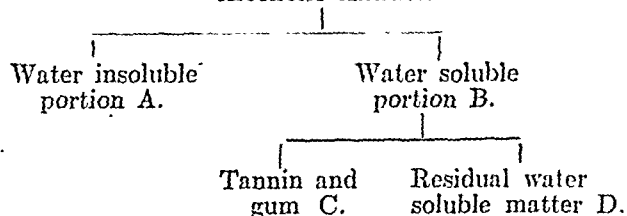
Even after incubation for 24 hours with salivary enzymes, pepsin and hydrochloric acid and the pancreatic enzymes, there was very little digestion of the mucilage. It therefore passes through the small intestine unchanged and during its passage it lines the mucous membrane, thus acting as a demulcent and lubricant.

Further, the mucilage is not acted on by the intestinal bacteria in the large gut. Its presence there in fact appears to have an inhibitory action on the growth of these organisms. I am very grateful to Captain C. L. Pasricha of the Bowel Diseases Enquiry, Calcutta School of Tropical Medicine, for testing the action of different bacteria on the mucilage. The seeds were soaked and the mucilage was either allowed to remain on the seeds or was separated from them by heating and then straining. The following table gives the results of the action of different organisms on the mucilage which

	After 20 hours.	After 48 hours.	After 96 hours.
<i>B. shiga</i> .. ..	No action on the mucilage ..	No action on the mucilage.	Mucilage still present.
<i>B. flexner</i> .. ..	Slight formation of gas. Mucilage unaltered.	Mucilage unaltered ..	Mucilage unaltered.
<i>B. cholera</i> .. ..	Good deal of gas formation but mucilage unaltered.	Mucilage unaltered ..	Mucilage unaltered.
<i>B. coli</i> .. ..	Gas formation. Mucilage unchanged	Mucilage unchanged ..	Mucilage unchanged.
Bacterial whole stool ..	Gas formation. Mucilage unchanged	Mucilage unchanged ..	Mucilage unchanged.

#### CRUDE DRUG.

##### Alcoholic Extract.



All these four fractions were carefully examined and their action tested on protozoa. None of them possess any great degree of toxicity to these organisms.

#### PHARMACOLOGICAL ACTION.

The present writer has found that a body of glucosidal nature does occur in small quantities in the seeds of *P. ovata*. It was pharmacologically inactive and was very difficult to obtain in a pure condition. No other physiologically active substances were found in the seeds. The tannins which are present in appreciable quantities have very little action on protozoa or bacteria. The efficiency of the drug would therefore appear to be entirely due to its large quantities of mucilage. This gelatinous substance was therefore carefully examined.

It has a jelly-like consistency and is acted on by the digestive enzymes to a very slight extent, especially when it is on the seeds.

was added to a broth culture in which the organisms were grown.

These cultures were allowed to stand at room temperature (35° to 38°C.) for a fortnight, but still the mucilage remained unaffected. That the mucilage does not form a good media for the growth of intestinal organism is shown by the fact that if it is allowed to set in a Petri dish and the surface is plated with the culture of such organisms as *B. shiga*, *B. flexner*, *B. coli*, faecal organisms, etc., no colonies are found to grow. It has also been shown that if a thin layer of the mucilage is spread on the surface of agar media inoculated with *B. shiga*, *B. flexner*, etc., the growth of these organisms is greatly inhibited.

That the mucilage is not acted on to any great extent by the digestive enzymes in the small intestine or the bacteria in the large intestine is further shown by the fact that large quantities of it can be seen in the stool after administration of the seeds. We gave a dessert-spoonful of powdered seeds to cats with a stomach tube. On opening up the intestine on the following day, the whole of the mucilage was found spread on the surface of the mucous membrane of the small and the large intestine. In the latter when the contents had assumed a solid form both the mucilage and the seeds were on the surface of the mucous membrane, forming a layer between the solid faeces and the surface of the mucosa. From these

experiments it is clear that the mucilage forms a coating over the surface of the ulcers. This would not only protect the injured mucosa from the irritating products of gastro-intestinal digestion but would also prevent access of the motile bacteria which would be entangled in the meshes of the gel. It was further noticed that the mucilage had a certain amount of detrimental effect on the entozoa existing in the gut of these animals. This point is under investigation.

The mucilage, further, being of a colloidal nature has a remarkable power of adsorbing the toxins. Our *in vitro* experiments have shown that the jelly-like mucilage from *P. ovata* seeds is very active in this respect.

#### THERAPEUTIC USES OF *P. ovata*.

The seeds were noticed early by the western practitioners and eventually found their way into the *Indian Pharmacopæia* in 1868. In the early part of the 18th century Fleming, Ainsleigh and Roxburgh have all spoken favourably regarding their value in diarrhœic conditions. Since then they have been very extensively tried by many western practitioners who have confirmed the opinion that they are useful in chronic dysentery and diarrhœa. Some clinicians have combined the seeds with ipecacuanha treatment. They are said to be very useful in all inflammatory affection, of the mucous membrane of the alimentary canal on account of their emollient, demulcent and laxative properties.

For the last 15 years the present writer has given very extensive trials to the seeds of *Plantago ovata* in the following conditions with excellent results:

(1) *Chronic bacillary dysentery*.—This condition is invariably associated with the presence of mucus in the stools. According to Acton and Knowles (1928) the commonest type of chronic bacillary dysentery in India is due to infection with Flexner's bacillus, next comes Strong's bacillus, and lastly Shiga's bacillus. Some of the chronic diarrhœas in the tropics are due to Morgan's bacillus or the para-dysentery group. The bowel in these conditions is generally ulcerated and the toxins absorbed from the ulcerated surface produce a diminution of tone of involuntary muscle of the gut wall, producing intestinal stasis, visceroptosis and a general toxæmic condition in the individual. Chronic diarrhœa with painful peristalsis persists for prolonged periods and may alternate with periods of constipation. The condition is intractable and may persist for years.

(2) *Chronic amœbic dysentery*.—These patients may have constipation or irregularity of bowels and the large majority show mucus in their stools. The degree of ulceration varies much according to the intensity of the intestinal symptoms. There are two types of these patients: the lean, thin, neurasthenic type who

suffer from habitual constipation, or constipation alternating with diarrhœa, or the fat, jovial type who suffer from chronic morning diarrhœa.

(3) *Chronic constipation with auto-intoxication* produced from other causes.

In the first two conditions the administration of the seeds gives considerable relief to the patient. It has already been stated that the seeds do not contain any active principles having any marked toxic effect on bacteria or protozoa. There are small quantities of tannin present but their effect in this respect is very slight indeed. The whole action of the drug appears to be entirely mechanical. The irritated or ulcerated surface of the intestinal mucosa is soothed by the demulcent action of the mucilage which covers the surface, and in this way prevents it from coming in contact with irritating products of digestion of food-stuffs, intestinal juices and gases which are always present in the intestine and which irritate the parts and prevent the ulcers from healing. Exclusion of this factor enables the ulcers to heal and the inflammation of the mucosa subsides. Further the absorption of toxins which takes place rapidly from the ulcerated surface is prevented by the coating of mucilage, which being of a colloidal nature, adsorbs the toxins from the gut and thus helps in excreting them from the body. As the jelly-like mass is not quickly acted on by the gastro-intestinal juices and bacteria, practically the whole of it is available, and passes out in the stool carrying with it the adsorbed toxins in the course of the next 12 hours. In this way the patient not only gets relief of the pain, tenderness or discomfort in the abdomen, but his general condition is also improved owing to decrease in the absorption of toxins. In chronic amœbic dysentery which has failed to react to intensive courses of emetine or the kurchi alkaloid, the author has tried prolonged courses of liquid extract of kurchi and Ispaghul with success. The patient is put on 2 drams of the extract 2 or 3 times a day, at the same time he takes 2 or 3 heaped dessertspoonfuls of the seeds twice daily, this treatment being continued for two months. Not only is there considerable relief of the symptoms, but examination of the stools shows disappearance of *E. histolytica*.

In chronic amœbic dysentery, where constipation is one of the main symptoms, the mucilage covers the fæces as they become solid in the large intestine and thus facilitates their passage through the large gut by acting as a lubricant. In this condition as well as in chronic spastic constipation its action may be aided by giving small doses of saline purgatives.

(4) "*Hill diarrhœa*."—This condition is not infrequently met with in people who go up to the hills and is more common among Europeans. The patient usually passes several stools in

the morning and the condition is accompanied by catarrh of the intestine. *P. ovata* seeds are particularly useful in the early stages. Not only is the irritated mucous membrane soothed and protected by the mucilage, but the fermentation is also inhibited and the stools assume a solid form.

(5) *Chronic diarrhœa in children* is also considerably benefited. Most of these conditions are due to irritation of the gut with bacterial toxins and the mucilage acts by removing this irritation.

#### DOSAGE AND MODES OF ADMINISTRATION OF *P. ovata* SEEDS.

The seeds are thoroughly cleaned from sand and grit and other extraneous matter with which they are always found mixed in commerce. This can be done by sifting them through a fine sieve or mosquito-netting and picking up anything which still remains with fingers. Before the seeds are taken they should be quickly washed once or twice in a cupful of water. The usual dose recommended is 2-4 drams, but considerably larger quantities, i.e., 1-2 ounces may be given with advantage. 2-3 heaped dessertspoonfuls of the seeds or more if necessary may be given 2 or 3 times a day. They contain no toxic principles of any kind and most of them pass out of the gastro-intestinal tract in 6-12 hours. In fact in some cases, especially when constipation is present, larger doses are essential as their action is produced partly by the lubricating action of the mucilage and partly by the increase in the bulk of the intestinal contents which mechanically stimulates the intestinal peristalsis. Four methods are recommended for the administration of the seeds:—

(1) The clean, dry seeds are put in a cupful of water and after a preliminary washing, 1 or 2 teaspoonfuls of sugar are added if desired. The mixture is then stirred and taken.

(2) The seeds are added to a cupful of water and are allowed to stand for 20—30 minutes till all the mucilage comes out. If desired some sugar is added and the mucilaginous mass is then swallowed.

(3) A mucilaginous decoction is prepared by boiling the required quantity of the seeds in a couple of pints of water till the quantity is reduced to about half. This is then taken divided into doses of 2 to 4 ounces and taken every 2 or 3 hours. It has already been pointed out that the mucilage is not altered by boiling.

(4) The mucilage-containing cover of the seeds is separated from the seeds by crushing them and separating the husk by winnowing: 1 to 2 teaspoonfuls of it are given in a cupful of water with a little sugar. This preparation is preferred by many indigenous practitioners to whole seeds, especially in acute conditions of the gastro-intestinal tract.

The present author prefers the first method in ordinary chronic forms of dysentery and diarrhœa as it allows the seeds to mix thoroughly with the intestinal contents and in this way enables them to spread over the whole of the surface of the mucous membrane evenly. If the mucilage is allowed to form outside it conglomerates into sticky masses and is not evenly distributed and passes out of the intestine in lumps. The decoction and mucilage-containing cover separated from the seeds is preferable in sub-acute types of dysenteries both of protozoal and bacillary origin. Our *in vitro* experiments on the action of digestive enzymes on the mucilage show that it is least acted on when it is on the seeds. When separated from the seeds as when a decoction is made, the mucilage is changed by the digestive enzymes into a non-mucilaginous substance after incubation for 24 hours, whereas that on the seeds is little altered. This supports the superior action of the whole seeds. The drug has got the advantage of being tasteless, in fact with sugar it is quite pleasant to take. It is, therefore, not objectionable to take and is very suitable for children.

#### DISCUSSION.

Various preparations of paraffin are being used as intestinal lubricants. They enter the cæcum mixed with the iliac contents and keep the contents of the large gut soft. In addition they accelerate the passage of fæces through the large intestine which consequently does not become overloaded. Paraffin being a mineral product is not absorbed, and practically the whole of it can be recovered from the stools. A perusal of what has been said about the mucilage of *P. ovata* seeds will show that they act in very much the same way as liquid paraffin does, so far as the lubricant and constipation-relieving effects are concerned. The drug is further free from many disadvantages which liquid paraffin possesses. It is well known that even the best preparations of paraffin are not free from producing irritant effects, and many cases of malignant disease of the large gut have been attributed to its long continued use. *Eczema ani* not uncommonly occurs in persons habituated to its use and "*paraffin pains*" are not of very rare occurrence. It has also been stated that long continued use, of liquid paraffin may prevent absorption of nutrient material from the intestines by forming a thin impermeable coating round the intestinal villi and cases of malnutrition have been recorded after its prolonged use. *P. ovata* mucilage is a vegetable product and is free from all these disadvantages, besides being very much cheaper. Two or three dessertspoonfuls taken at bed time produce the same laxative effects as liquid paraffin.

#### SUMMARY AND CONCLUSIONS.

The seeds of *P. ovata* are very beneficial in chronic dysenteries of amœbic and bacillary

origin and chronic diarrhoeas due to irritative conditions of the gastro-intestinal tract. A glucoside named *Aucubin* has been found in the seeds but it is physiologically inactive. The tannins which are present in appreciable quantities have little action on the entamoeba or bacteria. The action of the drug would therefore appear to be purely mechanical, being due to the large amount of mucilage which is contained in the superficial layers of the seeds. This mucilage is shown not to be acted on by the digestive enzymes, and therefore passes through the small intestine unchanged. It lines the mucous membrane of this part of the gut and its demulcent properties give it a protective and sedative action. In the large gut the intestinal bacteria have been shown to have little or no action on the mucilage. Practically the whole of it is passed out unchanged during the 12 to 24 hours following its administration. During its passage through the gut it coats the inflamed and ulcerated mucosa and protects it from being irritated by the fluids and gases, the products of gastro-intestinal and bacterial digestion. This enables the lesions to heal quickly. The toxins present in the gut are further adsorbed by the gel and their absorption into the system is prevented. The seeds are taken in large quantities and as they swell up in contact with water they increase the bulk of the intestinal contents and in this way relieve chronic constipation by mechanically stimulating the intestinal peristalsis. The mucilage of *P. ovata* seeds acts in very much the same way as liquid paraffin. It is very much cheaper and is further free from the injurious effects produced by the habitual use of the latter drug, e.g., malignant disease of the colon, eczema ani, paraffin pains, etc.

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### A NOTE ON THE ACTION OF EPHEDRINE ON TEMPERATURE.

By B. B. DIKSHIT,

Professor of Pharmacology, Medical College, Vizagapatam.

THE pharmacological action of ephedrine, the alkaloid from the Chinese plant *ma-huang*, has been studied in detail by numerous observers all over the world. Its vaso-pressor and broncho-dilator effects have been made use of extensively in therapeutics. The midriatic action and the increase in the nasal volume produced by the local application of the drug have greatly increased its therapeutic uses.

The literature on the subject has grown enormously in recent years and a reference to articles by Chen, Schmidt, Read, Chopra and others will give all the information on the subject. It is interesting to note, however, that although originally used in China as a drug reducing the body temperature, this aspect of its pharmacological action has not been experimented upon very thoroughly. In studying secretions some workers have alluded to its action on sweat secretion and found that it is not affected in any way. Text-books like Cushny's (1928) mention the action on temperature and say:—"The alkaloid has little effect upon secretions such as the sweat, nor does it alter the body temperature." Chopra and his associates (1929) studying the pharmacological action of pseudo-ephedrine find that it does not increase the sweat secretions. In comparison of the volumes of work done on other systems, however, the work on the action of the drug on body temperature is remarkably small.

An attempt was therefore made to see how ephedrine affected the body temperature. Experiments were conducted on 56 rabbits which were fed on a diet of gram and green foliage and kept under constant observation. Male rabbits were selected as a rule, but the series contained a number of females as well. The response in the two sexes did not appear to vary much. The average weight of the rabbits was approximately 2 kilos. The rectal temperature was taken in all the experiments every half hour.

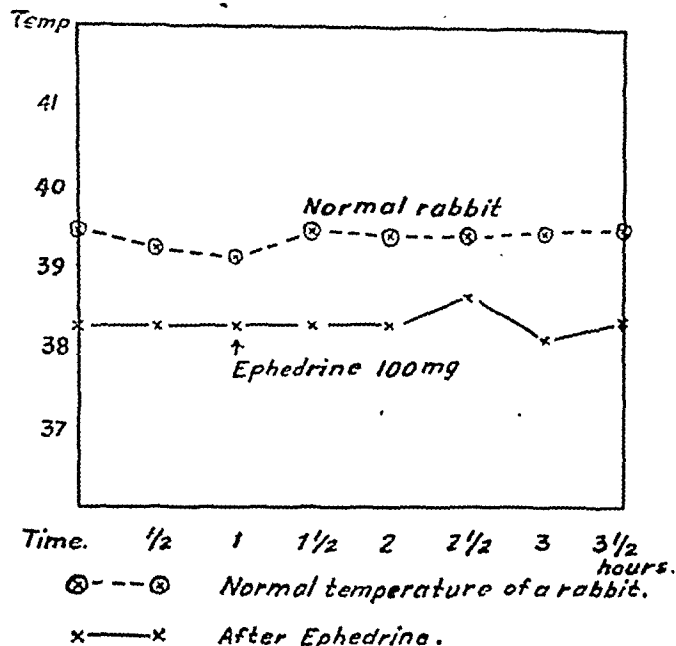
The normal rectal temperature of rabbits is maintained at a fairly constant level, when seen with observations taken every half hour. The temperature of different individuals varies, but is fairly constant for the same individual. The variations as a rule are not more than 0.5°C. Occasionally however more wide variations are seen. Control experiments were done in each batch of rabbits to note how far the normal variations under laboratory conditions occurred on experimental days.

The dose of ephedrine hydrochloride varied from 2.5 to 10 mg. per kilo. intravenously and 50 mg. per kilo. intramuscularly. The intramuscular method was mostly preferred. Injections of ephedrine showed no definite action on the temperature of normal animals. Sometimes the temperature was raised slightly, at others it was slightly lowered or showed the same variations as were seen in the normal controls. It appears however that the tendency is towards raising the temperature to a small extent. Graph 1 shows two typical curves of a control rabbit and one with 50 mg. per kilo. of ephedrine.

The effect of the drug on rabbits in whom fever was artificially induced was next tried. Some methods like injection of milk and other proteins were tried, but Killiani's method (1910) was found to be the best. A four or five-day

old broth culture of *B. coli communis* was injected in rabbits which gave an elevation of temperature of approximately  $2^{\circ}\text{C}$ . which was maintained for a fairly long time. Controls were taken by noting the normal rise after an injection of broth only, and the effects produced

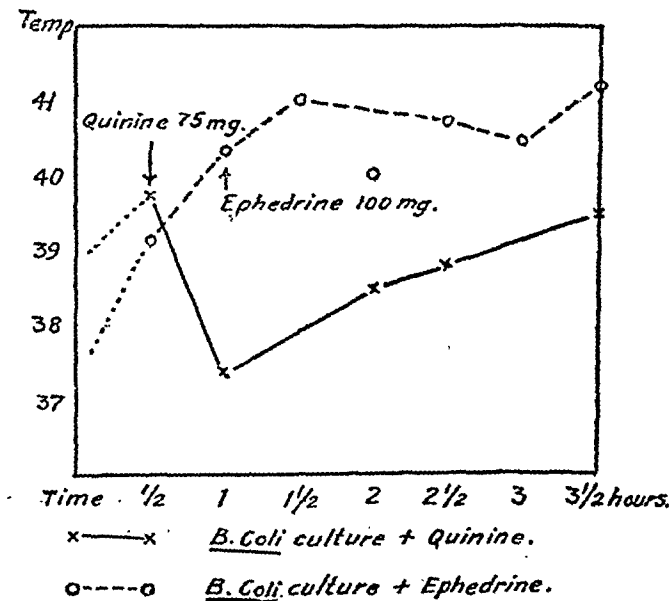
GRAPH 1.



Shows temperature curves of two rabbits, one of which received an intramuscular injection at the arrow mark of ephedrine; the other served as control. Note that ephedrine does not change the temperature to any appreciable extent.

by antipyretics like quinine and antipyrine. Graph 2 shows the effects of quinine with subsequent recovery, while the curve after ephedrine maintains an upward direction throughout. This supports the observations made in

GRAPH 2.

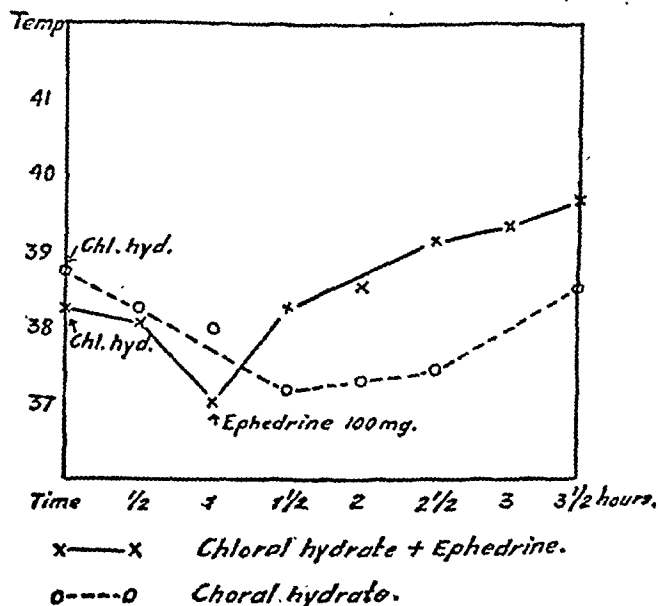


Shows temperature curves of two rabbits rendered febrile by an injection of *B. coli* broth culture. Quinine and ephedrine injected intramuscularly at the arrow mark. Note fall after quinine and a tendency to rise after ephedrine.

the beginning that ephedrine tends to raise the temperature slightly.

To find whether the temperature was raised by ephedrine at all, another series of experiments were done in which the temperature of the animals was below normal. This was brought about by injections of chloral hydrate intravenously. Doses varying from 0.15 to 0.25 grms. per kilo. were injected. A combination of picrotoxin and chloral was tried, but this was not found to have any specially marked effect. A dose of chloral hydrate lowers the temperature by  $2^{\circ}$  or  $3^{\circ}\text{C}$ . which is maintained at a low level for more than three hours. An injection of ephedrine in such experiments elevates the temperature quickly, sometimes within half an hour. Graph 3 shows two typical curves in such experiments.

GRAPH 3.



Shows temperature curves of two rabbits whose temperature was lowered by chloral hydrate. Ephedrine injected in one at arrow mark. The other served as control. Note the immediate rise after the injection of ephedrine and an upward direction of the curve.

#### DISCUSSION.

It would be out of place here to enter into a discussion on the causes producing fever. The number of ways in which fever is produced, and the complicated mechanism of regulation of temperature, as far as is worked out, are well known to pharmacologists. Attention may here be drawn however to one of the numerous influences regulating the heat mechanism, namely, the stimulation of the sympathetics. A stimulation of the sympathetic nervous system is known to be responsible for elevation of temperature. Cocaine, apart from its stimulant action on the higher centres and convulsive effects, produces a rise in the temperature under certain circumstances, and the most typical example of a sympathomimetic drug producing a rise in temperature is tetra-hydro-B naphthalamine. This drug is known to exert a pharmacological action like that of adrenalin, and

produces a well marked rise of temperature when injected in animals. We therefore possess some evidence that sympathomimetic drugs have a tendency to increase the temperature. Ephedrine is proved beyond doubt to be a typically sympathomimetic drug. It is therefore intelligible that if ephedrine produces any effect at all on the temperature, it is in increasing it. The experiments mentioned above lead us to the same conclusion. Although ephedrine does not produce any marked effect on the normal temperature, it has no tendency to lower the temperature of febrile rabbits and markedly raises the temperature of animals rendered subnormal by administration of chloral hydrate.

#### Summary and conclusion.

1. Experiments were conducted on 56 rabbits to determine the effects of ephedrine on the temperature.

2. Normal animals do not show marked variation of temperature after an injection of 2.5 to 10 mg. ephedrine hydrochloride intravenously, or 50 mg. intramuscularly, per kilo. of body weight.

3. Animals rendered febrile by injections of a broth culture of *B. coli communis* show no tendency to regain normal temperature after injections of ephedrine. On the other hand the temperature shows a slight tendency to rise.

4. The temperature of animals lowered by chloral hydrate is restored to normal, often within half an hour, by an injection of ephedrine hydrochloride and sometimes raised above normal.

My thanks are due to Dr. C. Ramamurti, Professor of Bacteriology, for supplying *B. coli* cultures and to Dr. Kameshwar Rao and Mr. Moursund of this department for carrying on the work of taking the temperature of the animals every half hour. But for the steady work of the last two workers, this study would have been very difficult.

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### A POSSIBLE PITFALL IN MAKING LEUCOCYTE COUNTS.

By S. K. GHOSH DASTIDAR, M.B., D.T.M. (Bengal),  
*Lecturer in Pathology, Prince of Wales' Medical College,*  
*and Assistant Bacteriologist to the Bihar and Orissa*  
*Government, Patna.*

(A case and commentary.)

THE following notes of a case which has features of interest both for pathologists and clinicians, are published to show how easily one may make a serious blunder in a simple examination like a leucocyte count in some cases, unless proper precautions are taken.

*Clinical description.*—Mrs. A, aged 17, was married two years ago. About a year ago she had an attack of dysentery attended with a little fever and suffered for nearly two months. At this time she began to show early signs of anæmia, marked pallor of the skin without wasting, slight breathlessness on exertion, swelling of the legs and ankles, and a systolic bruit at the apex with some conduction towards the axilla, attended with slight fever which never left her till the end. Later these symptoms became so much aggravated that she felt considerable difficulty in breathing when lying quietly in bed; the whole body including the face and arms was slightly œdematous, the complexion was lemon-yellow and the apex-beat was displaced about an inch from the left midclavicular line.

She collapsed two days after the blood, etc., were examined.

*Pathological Notes.*—Examination of the stool and urine did not reveal anything abnormal. Blood culture gave a negative result. The routine examination of the blood showed the total count of red blood cells and white blood cells to be apparently 1,250,000 and 60,000 per c.mm. respectively; hæmoglobin 30 per cent.; the differential count gave polymorphonuclears 70 per cent., large mononuclears 3 per cent., lymphocytes 25 per cent., eosinophiles 2 per cent., besides a large number of normoblasts and megaloblasts. At the time of examining the stained blood film I was struck by the fact that leucocytes could hardly be found; there were not more than 2 per field and none at all in some, although I expected many on account of the high leucocytic count, but on the other hand nucleated red blood cells were present, from 5 to 7 per field. The presence of marked leucopenia in the differential count made me wonder whether the high total leucocyte count was due to the inclusion of the nucleated red blood cells at the time of counting.

The fluid used in the total leucocyte count contains acetic acid, gentian violet and distilled water; when this solution is mixed with blood in the correct proportions, it hæmolyzes the red blood cells, fixes and stains the nucleated cellular contents of the blood, which are recognized in turn for leucocytes in the counting chamber, since the leucocytes are the only nucleated blood cells under ordinary conditions, as blood-platelets do not come into consideration. If nucleated red blood cells are present, which is quite possible in severe anæmias as in this case, the count of the nucleated blood cells will also include these nucleated red blood cells in addition to the white blood cells and give a very high figure for the total leucocyte count. In order to arrive at the correct figure of the leucocyte count, I examined again 45 fields of the stained blood film and found the proportion of leucocytes to nucleated red blood cells to be



1 : 9; hence the corrected figure for white blood cells which was 60,000 at first sight, came down to 6,000 per c.mm.

**Conclusion.**—Fortunately such cases are far from being common. No reference has been made to such possible contingencies even in the standard books on hæmatology mentioned below. Whatever the case, one cannot afford to overlook this possibility and the oversight on the part of pathologists may change the whole outlook on the case and lead the clinician to a wrong diagnosis with disastrous results. I can think of no other method which could help us in getting at the correct figure of the leucocyte count where nucleated red blood cells are also present, for the latter behave exactly in the same way as the former in the counting chamber. Thus, if the total leucocyte count were 60,000 and the differential count showed 1 leucocyte to 9 nucleated erythrocytes, the relative proportion would be 1 : 9, thereby indicating the presence of 54,000 nucleated erythrocytes per one cubic millimetre. The corrected figure is obtained by deducting the nucleated red blood cell count from the total count. Hence the corrected figure for the total leucocyte count in this case was 6,000.

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#### CAUDAL BLOCK.

By J. G. MARTIN, M.D.,  
Taxila Hospital, Taxila, Punjab.

SACRAL or caudal block with novocain I have found to be a very useful analgesia. For operations on the genitalia, perineum and anus I have found it to be ideal. Two hours of complete anaesthesia are produced. During and after the operation the patient is capable of taking nourishment. Thus measures to combat shock may be maintained without interruption, and that in a manner most convenient for the physician and acceptable to the patient, that is by the mouth.

I have found it especially useful in cystoscopy of the male. So often these patients are emaciated, and this is frequently due to tuberculosis. They are not fit to receive a general anaesthetic, and particularly one of any duration. Cystoscopy, except in the hands of the very experienced, is often a tedious procedure. The value of cystoscopy does not appeal to the average Indian patient, who has come for

treatment, especially if it is combined with any discomfort.

In the case of difficult and painful strictures of the urethra it is invaluable. The surgeon may proceed with due deliberation and care. He is not impelled to hasten by the anaesthetic or the anaesthetist. He is free to develop at leisure his utmost skill and ingenuity—and these cases often require both. If then for any reason one should desire access to the bladder end of the urethra, this may be secured supra-pubically under local anaesthesia. Thus a two hours' procedure will not cause as much damage to the patient's general well-being as ten or fifteen minutes of rushed and unsatisfactory effort under general anaesthesia.

I have long felt that this should be an ideal anaesthesia for normal deliveries (obstetrical). Since in India such cases do not often come the way of a physician of the male species, I have had to wait patiently for my opportunity. Just recently opportunity arrived.

My patient was a European lady in her third labour. The previous two had been more or less prolonged, mainly due to the size of the infants, which ranged between eight and nine pounds. During the latter part of the second stage in the first labour chloroform was used (labour took place while in India; in the second labour ether administered—labour took place when in the U. S. A.). This patient was very much afraid of "twilight sleep" as the term is commonly used, because of its effect on the infant. Hence permission to use caudal block was only given on my assurance that it would in no way affect the infant. A couple of years previously I had been prepared to use this anaesthesia in the case of a European patient, but made the mistake of first rupturing the membranes, with the result that matters proceeded so rapidly that I had no opportunity to give the anaesthesia. In this case on making an internal examination and finding complete cervical dilatation, I performed the caudal block, and then after a few minutes ruptured the membranes between contractions. There was a delay before the next contraction, as is so often the case following the rupture of the membranes. But after that the contractions resumed their former periodicity and force. But the sharp cutting pain that makes women writhe at this stage gradually disappeared, leaving the dull backache with each contraction. Because of this the patient was able to co-operate most efficiently with her abdominal muscles. During former labours she informs me that the attending physician always scolded her for her lack of co-operation. The perineal muscles and cervix were relaxed and insensitive. This permitted me to manually assist in pushing the anterior lip of the cervix over the oncoming occiput, and then to dilate and iron out the perineum during contractions. This could all be done without any discomfort to





the patient. At this stage the progress of the head in its outward course was truly remarkable with as well preserved a perineum as she had. Then finally with full co-operation of the patient, I delivered the head over the perineum, by forcing the fingers of my right hand covered with a towel up into the rectum until I secured a leverage under the infant's chin through the recto-vaginal wall, and by placing my left hand on the occiput so as to restrain its progress. The experience of performing this manœuvre with the co-operation of a sane woman, rather than one wild from the second stage of anæsthesia, was to say the least a pleasant experience for me. The rest of the labour progressed normally with good contraction of the uterus. The infant weighed 8 lb. 4 oz. The second stage of labour had lasted about 25 minutes. It was possible to thoroughly examine the perineum and cervix for laceration without any discomfort. If there had been any they could have been repaired without any discomfort to the patient. The patient is very enthusiastic regarding this anæsthetic, not only because of the relief from pain but also because she has not experienced the feeling of exhaustion that occurred with her other labours.

I have used this anæsthesia in only one other obstetrical case. This case was one of an atonic uterus in an old primipara in which there had been premature rupture of the membranes. Here under caudal block a Barnes' bag was introduced, which was filled with 20 oz. of 1:3000 proflavin. Complete cervical dilatation was secured by interrupted traction on this for two hours, and the following head delivered with forceps. Mother and infant both living and well.

In performing the caudal block we follow the technique of Labat. When possible the patient is placed prone on the operating table. (In the obstetrical cases they lie on their side near the edge of the bed with their limbs drawn up.) The hips are elevated from 3 inches to 6 inches depending on the build of the patient. Tincture of iodine is applied from the gluteal cleft up over the sacral spines in an area 8 inches in diameter. This area is then suitably draped. The index finger is run down along the sacral spines towards the gluteal cleft. Just below the last sacral spine one comes on a depression, triangular shaped, of which the apex is the last sacral spine and the base is the line between two projecting bone processes called the sacral cornua. This is the sacral hiatus. Personally I find the sacral cornua more readily palpable than the last or fourth sacral spine. With two fingers of the left hand on the sacral cornua, with the right hand a little novocaine adrenalin solution is injected first intracutaneously, and then deeper into the depression with a fine needle. Then the needle used in making the spinal puncture with its stylet in position is passed slightly

upward of the vertical position through the skin into this depression. It passes through skin and a fibrous covering until it impinges upon bone. Then it is slightly, very slightly withdrawn, and the hand holding the needle is dropped a little toward the gluteal cleft, passing the needle upwards in the sacral canal. This should go readily to a distance of 6 cm. The stylet is withdrawn, and suction is added to assure one that the point of the needle is not in a blood-vessel, or has not entered the dural canal. If either has been punctured the needle is withdrawn slightly. 33 to 40 c.c. of 2 per cent. novocain with not more than 0.5 c.c. of adrenalin solution are injected. Personally I have found 20 c.c. quite efficient. Most of this solution is injected without moving the needle, and very slowly. The remainder is injected while withdrawing the needle. The injecting of the fluid requires practically no pressure. If pressure is required one is not in the canal, but in the fibro-muscular tissue external to the vertebrae. Complete anæsthesia is secured in 15 to 20 minutes.

Personal correspondence regarding my article in the *Indian Medical Gazette* for April 1930 on the technique of spinal anæsthesia, shows that in one point I have not made myself clear. The spinal puncture and introduction of the anæsthetic solution is done with the patient sitting on the operating table, much in the manner in which the tailor sits on the veranda. When the needle has been withdrawn, the patient is placed in any desired horizontal position on the table, just so that the head is not above the level of the rest of the body. In the case described in the April number of the *Gazette* an anæsthesia suitable for operation on the head was sought, and since more than twice the amount of novocain and spinal fluid were introduced, some effect on the circulation was feared and the patient was kept in a 15 degree Trendelenburg position. But since then we have performed eight operations on the head under this anæsthesia, and in one case used 0.30 gm. of novocain mixed with 8 c.c. of spinal fluid, and in no case have we been compelled, on account of the fall of blood pressure due to the anæsthesia, to place the patient in Trendelenburg. When one can use 0.30 gm. of novocain intra-durally with no apparent drop of blood pressure then 0.10 gm. of novocain, the amount necessary for anæsthesia below the belt, this must be as safe an anæsthetic as there is for general use.

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#### Corrigendum.

We regret that the colour plate on the page opposite was inadvertently omitted from our issue for May 1930. It should have accompanied the article by Dr. L. E. Napier and Dr. C. R. Das Gupta on "A Clinical Study of Post-Kala-Azar Dermal Leishmaniasis" on pp. 249-256 of that number. It illustrates the erythema or butterfly rash described in p. 250, second column.--  
Editor, I. M. G.



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## A Mirror of Hospital Practice.

### AN UNUSUAL ABDOMINAL TUMOUR.

By M. L. TRESTON, F.R.C.S.,

MAJOR, I.M.S.,

Civil Surgeon, Rangoon, Burma.

A CORINGHEE coolie, aged 20, came into hospital on 21st February, 1930, with a history of a lump in the upper left quadrant of his abdomen, which he had noticed for 14 days. He could move the lump round from the middle line, to the right under his costal margin, and only complained of a feeling of nausea when the lump was swung round too quickly. There were no other symptoms. The lump on examination seemed to be the size of a slightly enlarged spleen, and had a notch on its anterior border. It could be moved freely from under the costal margin to the middle line of the abdomen, and it was diagnosed as a floating spleen. A peculiar feature of the case was that the man insisted on operation. On the 23rd February abdominal section was performed. After opening the peritoneal cavity, a hand was thrust under the left cupola of the diaphragm, to bring forward the spleen, but the tumour was lying freely moveable in the cardiac end of the stomach. With visions of hair-balls, the necessary gastrotomy was done, and the tumour removed. The tumour was about the size of a man's fist, with a notch on its anterior border. It was covered with a friable substance which resembled the recent phosphatic covering of a bladder stone, but it was very light. It cut easily and firmly on section, disclosing a light yellow and uniform core, and the smell was peculiar. So peculiar, in fact, that when the tumour was duly smelt by the various doctors standing round, the answer came back with one accord: *Cheese*. Now it is an axiom that anything that gets through the cardiac end of the stomach can get through the pylorus, and the patient could not possibly have swallowed a lump of cheese that size. So, when the patient was sitting up after his operation, a little persuasion did the following tale unfold. Fourteen days prior to coming to hospital, the patient fell off a cart and was knocked out. His friends brought him into the nearest house, and, to revive him, they poured half a bottle of neat brandy down his throat. As that did not bring him to, they melted some ox fat and ghee and poured about a pint of that down the unconscious man's throat. He came to in 48 hours' time, and by this time the mixture of ox fat and ghee had set. The analysis of the "tumour" showed it to be soluble in ether, readily saponifiable, and composed of fats.

### A CASE OF TREPHINING OF SKULL.

By S. L. BHANDARI, M.B., B.S., P.C.M.S.,

Assistant Surgeon, In-Charge Civil Hospital,  
Sheikhupura.

ON 24th May 1929 a patient, A. D., aged 25 years, was brought to the hospital on a *charpai* from a neighbouring village with paralysis of the left side of the body, resulting from a lathi blow on the head. For 8 days he had been treated in an outlying dispensary without any benefit.

*Signs and symptoms.*—(a) *Local.*—No mark of injury on the head except a slight depression on both sides of middle line, which looked normal, some œdema and a little pain on the left side.

(b) *General.*—1. Complete paralysis of the left side of body with inability to move even his little finger.

2. All reflexes had been abolished.

3. His face was only partially affected.

4. The right side of the body was also weakened to some extent.

5. Control over urine and stools was present.

6. The pupils were normal and reacted to light.

7. Speech was not affected.

8. The temperature was normal and the patient lay flat on his back.

More than a week having already passed, fearing that it was too late and that permanent damage might have been done to the brain, four days more passed in indecision without the slightest improvement. At last, on 28th May 1929, seeing no other alternative, it was decided to operate.

*Operation.*—Under chloroform an incision was made a little to the right of the middle line, and the right parieto-temporal region exposed. A linear fracture of the skull,  $3\frac{1}{2}$  inches long, was discovered extending from the top of the head to the right temporal region. The skull was then trephined at a suitable place and on lifting the portion of bone, a small clot of blood was discovered just underneath. There was no depression of bone or fracture of the inner table. The opening was enlarged and the blood clot easily lifted and removed. There was no sign of injury to the dura mater. Considering that the clot was insufficient to produce the condition, the dura mater was opened by an incision about  $1\frac{1}{4}$  inch long. As soon as this was done, brain matter, along with a good deal of sero-sanguinous fluid came out with a great force. Pressure having thus been relieved, it was considered inadvisable to interfere any further and the skin flap was replaced without stitching the rent in the dura mater.

*Progress of the case.*—For two days, the patient showed no signs of improvement, and it was feared the operation had been a failure. On the morning of the 3rd day, however, the patient was overjoyed to find that he could move the fingers of his left hand. On the 4th day he could move his hand and forearm as well to some extent. On the 5th day, he moved his toes with a great effort in my presence. On the 6th day, he could move his foot and leg also. By the 5th June, 1929, i.e., the 7th day after operation, the wound had healed by first intention, and the patient could walk, supported by another person.

This steady and uneventful recovery continued, and on 26th June 1929 the patient walked to his village, with a slight feeling of heaviness in his leg, immensely pleased with the result of the operation.

I am deeply indebted to Dr. Mathra Das, Civil Surgeon, for the kind permission to publish this case.

# NOTES ON THE TREATMENT OF VARICOSE VEINS BY SCLEROSING INJECTIONS.

By W. H. CRITIEN,

CAPTAIN, I.M.S.,

H. B. M.'s Consulate, Sistan.

THAT the treatment of varicose veins by sclerosing injections can be efficacious in long-standing cases of an extreme nature is shown by the following notes on a case in point. The undoubted and rapid success attained without the patient's suffering any loss of time laid up, or any inconvenience other than the transitory pain at the moment of injections, says a great deal for a method of treatment, the technique of which is simplicity itself in the hands of any one with knowledge of intravenous work. For this reason these notes may be of interest to those who, like the writer, have not yet acquired intensive experience in its application.

The patient was a well developed man of about 35 years of age. In 1924 he had first noticed that the veins in his left calf were swollen, but at that time they gave him little or no trouble. Of athletic habits, he regularly took part in games of football, tennis and hockey, but during the last twelve months the increasing size of his veins had been giving rise to a proportionate increase of discomfort—a sense of weight and fullness in the limb—which was gradually but surely restricting his normal activities.

On examination the patient was found to be suffering from an extensive varix of the internal saphena system in the left calf. The veins formed a large tortuous mass on the medial aspect of the calf. In fact so advanced was the condition that doubts were entertained as to whether the injection treatment could adequately deal with it. The patient however being particularly anxious to avoid an operation and the consequent lay up in hospital, it was decided to give this form of treatment a trial.

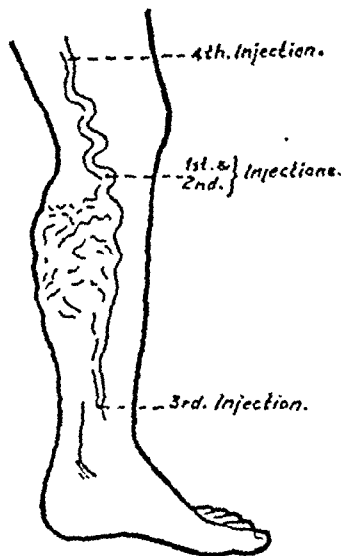
To attempt to sclerose the extensive system of grossly dilated veins was considered to be beyond the realm of practical politics, and the alternative plan was conceived of attempting, firstly, to reduce the backward pressure of the blood column on the veins, by inducing sclerosis in the internal saphenous vein at a point proximal to the varicose group. In this manner it was hoped to restore, as far as backward pressure was concerned, the function normally fulfilled by the now incompetent valves. Then, having thus secured some measure of relief, to resume the attack by blocking the distal extremity of the same vein, with the object of side-tracking the system involved.

Accordingly, having ensured that no obstruction in the deep circulation existed, by the simple test of tying a ligature below the knee and making the patient walk round the room, when the superficial veins emptied themselves into the deep circulation, the treatment was commenced. The method adopted was that described at length by Kennedy Murphy with certain minor modifications, which are referred to in these notes, and the sclerosing medium used was a solution of sodium salicylate in freshly prepared normal saline.

On November 14th, 2 c.c. of a 20 per cent. solution were injected into the internal saphenous vein at a point just below the prominence of the medial condyle of the tibia (see accompanying sketch). On the 16th the patient appeared for his second injection, by which time obvious signs of sclerosis in the course of the vein at the site of the first injection were apparent. The second injection was then given—3 c.c. of a 30 per cent. solution—in the same vein at a point just distal to that of the first injection.

By the 18th it was evident that the first injection had obliterated  $1\frac{1}{2}$  inch to 2 inches of the vein, and the greater part of the vein mass had collapsed. The third injection was then given into the distal extremity of the vein at a point just above the medial malleolus, the same amount and the same strength of solution being used as for the second injection.

By the 21st November the venous bunch had collapsed entirely, the veins just showing as faint blue lines through the skin. Two days later a fourth injection of the same strength and quantity was given into the



saphenous vein at a point in its course immediately proximal to the medial condyle of the femur—where the dilated vein could be felt as a "gutter-like" track. This injection was considered necessary as a support for the "pivotal" sclerosed area induced by the first two injections.

No further treatment was administered and the patient had resumed his hockey too next day wearing, purely as a precautionary measure, a light crepe bandage to give support to his calf. Thus in less than a week's treatment this patient had been completely cured.

The technique described by Kennedy Murphy and elaborated by Sicard insists on two syringes being used—one empty, the other filled with the sclerosing fluid, and one needle. With the patient standing on a chair the needle on the empty syringe is then inserted into the selected vein, the syringe is taken off, the needle being left in place, and the patient is then made to lie down on an operating table close by. The full syringe is then applied to the needle and solution injected. The *raison d'être* of this cumbersome procedure is said to be that the sclerotic action of the injection is more effective on an empty or relatively empty vein than on a full one.

Having experienced some difficulty in a previous case in ensuring that the needle did not shift its position during the transition of the patient from the upright to the recumbent posture, I decided to forego this part of the prescribed ritual in the treatment of the case under review, and to inject the solution with the patient in the upright position. The injection having been made slowly and the needle

withdrawn smartly, the patient was then made to lie down for a few minutes on the table.

I submit that the results set forth above justify, in my opinion, the conclusion that nothing of the effectiveness of the injections is lost by this minor modification.

As to the rest of the technique, apart from the usual strict attention to asepsis, there is one point which, in my opinion, demands special emphasis, and that is the absolute freshness of the solution used. To ensure this I have hitherto found it best to insist on its preparation on the spot, *immediately* before it is injected into the patient. A sharp hypodermic needle of fine calibre should be used.

In conclusion two main facts seem to me to stand out prominently in this case viz:—

(1) The efficacy of sodium salicylate injections in dealing with an extensive varicose system of veins.

(2) That the desideratum of putting a large collection of varicose veins out of commission can be effectively attained by "blocking" them off at a pivotal point instead of laboriously attempting to sclerose large sections of the veins themselves.

### A CASE OF PELLAGRA.

By ANAND SWARUP, M.B., B.S., D.T.M. & H.,

M.R.C.P. (Edin.),

Medical Officer, District Hospital, Ballia.

PELLAGRA, although mentioned as a tropical disease, is a comparatively rare disease in India. A few cases have been reported from North Bihar. The following case is therefore of interest as it comes from a district of United Provinces adjoining Bihar.

B. L. S., resident of village Tari-Bara-Gaon, Haldharpur, District Ballia, was admitted to the District Hospital, Ballia, on 17th February, 1930, having the following complaints:—

(1) Burning sensation on the dorsal surfaces of both feet, on the extensor surfaces of both the legs and on the backs of both hands and wrists, accompanied by pigmentation and roughening of the skin of the affected parts.

(2) A sensation of pins and needles, and sometimes of creeping insects on soles of feet and palms of hands.

(3) Cough and sore throat.

(4) Loss of sleep during the night.

(5) Dizziness, giddiness, and the sensation of foreign matter in the eyes.

(6) Vague pains in the joints and various other parts of the body.

*History of Present Illness.*—Two and a half years ago the patient exposed himself to rain and wind one evening during the month of February. Next day he had high fever with sore throat, and, later on, delirium accompanied by cough and expectoration and pain in the joints. The fever and pain in the joints abated after 10 or 12 days, but he has never been quite fit since this illness. He began to get a daily evening rise of temperature, with intervals of comparative freedom from symptoms. This state of affairs continued for about a year when the patient got an attack of soreness of the tongue, palate, the inner surfaces of the cheeks, and the throat. The attack lasted a few days and then gradually subsided. From time to time however these attacks were repeated. During the exacerbations of

this mouth condition there was profuse salivation and a saltish taste, and chewing and swallowing of food were very painful. About the same time as the first attack of stomatitis, that is about a year from the commencement of the patient's illness, he got redness, swelling and a burning sensation over the backs of both feet and hands, and on front and sides of his legs. Burning and tenseness gradually subsided after about a fortnight, and then desquamation occurred in patches and in other patches the skin remained dark and rough. Along with this erythema the patient had severe pain in his joints. The patient is definite that



The skin condition has been well brought out on the feet, though not very clearly on the hands and face. The hands and face, however, were practically as much affected as the feet. The left lower limb shows poor development (see text).

he feels better during the rains and winter, but that all his troubles increase during spring and summer, that is to say from February and March. It is of some interest that the patient came to the hospital on 17th February. The sensation of burning over the affected area becomes acute on exposure to the sun. Last year during October the patient suffered from diarrhoea which lasted about 20 days.

The patient does not give a history of eating maize, except on very rare occasions. Indeed in his part of the district, according to him, maize is seldom grown. His occupation is that of a field-labourer. He is unmarried, is temperate in his habits, and is a non-vegetarian, but it is only on occasions that he can afford fish or meat.

*History of Past Illness.*—The patient does not give a history of having suffered from any venereal disease. In his childhood the patient suffered from some inflammatory affection of his left hip-joint which resulted in considerable shortening of the left lower extremity. This limb also shows lack of development of its muscles, as compared to the right limb.

*Condition on Admission.*—The patient is a young man of 31 years age, with a few prematurely grey hairs. His face is darker in comparison to the rest of the body. This is due to dark patches and roughening of the skin on the nose, cheeks, and forehead. The patches over the cheeks and nose together form a typical butterfly appearance. Characteristic erosions are present in the angles of the mouth, and these erosions are beginning to get whitish in appearance. Pyorrhœa alveolaris is present and several incisor teeth are shaky. The surface of the tongue is wrinkled, and there is a small area of erosion on both sides of the tongue near its root. Marked tremor is noticeable when the patient puts out his tongue. There are a few reddish spots present on the inner surface of the cheeks and palate. There is chronic congestion of the throat.

The backs of both hands are swollen, the skin is rough and covered with dark patches intervening with lighter patches due to desquamation. The dorsal surfaces of both feet are also slightly swollen, that of the left foot being shiny. Dark patches, and areas of desquamation, and roughening of the skin are present on the dorsa of the feet and on the front and sides of both legs and knees; on right lower extremity the condition extends up to the middle of the thigh. In the upper extremities the skin condition extends up to the distal third of the forearms.

The appetite is good, bowels regular, spleen and liver are not palpable. The heart and lungs are normal.

*Nervous System.*—Tremor of the tongue is quite definite. The right knee jerk is markedly exaggerated, the left knee jerk can be elicited, but it is not so brisk as that of the right side (probably on account of the poor development of muscles on his side). He suffers from sleeplessness, giddiness, and a peculiar heaviness of the head. His memory is quite good.

*Diagnosis.*—Although at the time of admission there was no acute condition of the tongue or the mucous membrane of the mouth, yet the wrinkled surface of the tongue, a few reddish spots on the palate, and the definite history of several attacks of sore tongue and mouth during which mastication and deglutition became painful, are quite characteristic of pellagra, as also are the erosions in the angles of the mouth, which are beginning to assume the characteristics of leucoplakia. On the seventh day after admission the patient had an attack of profuse salivation with inflammation of the margins of the tongue.

The symmetrical eruption on the back of the hands and feet and on the legs, and forearms, with its dark patches, areas of desquamation, and coarsening of the skin, the butterfly patch over nose and cheeks, leave no doubt about the diagnosis of the case.

Implication of the nervous system is indicated by tremor of the tongue, by the exaggerated knee jerks, by the sleeplessness, giddiness, heaviness of the head, and the feeling of pins and needles on the palms of the hand and the soles of the feet.

Seasonal connection is shown by the fact that the disease is aggravated during spring and summer, similarly the burning and tenseness on affected parts become acute on exposure to the sun.

Maize does not form a staple article of diet of this patient, but it must be remembered that sporadic cases of pellagra have been reported from the British Isles,

Germany, Poland and China where maize does not at all enter the dietary.

*Treatment.*—The patient has been put on Fowler's solution by mouth, 5 drops three times a day. He is also now taking fish and meat. In the beginning the patient showed some improvement, possibly as a result of hopefulness on the part of the patient, and change in his surroundings. The tremor of the tongue diminished, the vague pains in various parts of the body were not so troublesome as before, he could sleep better, and even the affected skin seemed to be clearing up a little bit. The improvement, however, was only temporary. On the seventh day the patient got an attack of sore throat and sore tongue with profuse salivation, the pains became severe in his limbs and in the evening the temperature rose to 100°F. The temperature went down after 4 days, and patient felt better. It may be added here that one injection of 0.45 gramme neosalvarsan was given intravenously, but it did not make any difference in the condition of the patient and hence was discontinued.

In conclusion, I have to thank Dr. Shyam Lal, Civil Surgeon, Ballia, for his valuable hints about the case.

### THREE CASES OF TOXÆMIA DUE TO ASCARIASIS.

By N. B. GHOSH BISWAS, L.M.F., L.T.M.,

Medical Officer In-Charge, Serispore Tea Estate,  
P. O. Hailakandi (Cachar).

*Case 1.*—About January, 1927, a girl aged about 10 years was brought to me by her father who believed that she was possessed by evil spirits. He stated that she had been in sound health, but on the previous evening she had been missing and was eventually found under a bush. That whole night the girl did not sleep, muttered nonsense, occasionally weeping and laughing. The following day she was treated—or rather harassed—by an *ojah* who, failing to scare away the ghost, had the goodness to recommend her to come to me for treatment.

I found the girl in a dazed condition; with a vacant stare and muttering incoherently. Her tongue was thickly coated and her temperature normal. I gave castor oil mixture followed by bromides. Matters remained unchanged. Thinking that round-worm might be the causative factor, I administered santonin gr. 1½ with calomel, and the girl passed 36 round-worms in four motions. There was an uninterrupted recovery, and since then the girl has been quite normal.

*Case 2.*—During March, 1928, I was called to see a 2½ years' old Santal baby who was reported to be having convulsions with high fever. I found the baby in a convulsive seizure, fists tightly closed, legs straight and stiff, and eyes rolled up. A cold douche on the head was given and quinine bi-hydrochloride gr. iii was injected intramuscularly. Convulsions stopped and temperature came down to 102°F. For the next two days temperature ranged between 100°F. to 102°F. but without any more convulsions. On the third day the baby began to pass loose motions and there was tympanites. Henceforth treatment was continued symptomatically, attention being paid more to diet and nursing, but the baby began to lose ground and on the 5th day was hopelessly ill. Pulse rapid and feeble, respiration hurried, and eyes closed. In the evening the baby vomited one round-worm. Santonin in divided doses with calomel was given and during the following two days 24 round-worms were passed. On the 8th day temperature returned to normal and the baby made an uneventful recovery. The case resembles what Chauferd and others (according to Osler) termed typho-lumbricosis.

*Case 3.*—On the 5th January last, a girl aged 17 years was reported to have fever and was given 10 grs. of sulphate of quinine in solution. On the 6th I was called

in and found her in an epileptoid attack—fists closed, hands and feet being thrown about, face twisted to one side, and foaming at the mouth. The attack lasted for about 4 minutes. She was given *mistura alba* and bromides. *Santonin*, gr. 1½, was ordered at night to be followed by castor oil on the following morning, but no worms were passed. She was anæmic and considerably debilitated owing, as the relatives stated, to an attack of dysentery which she had had in September. On the 7th there was complete aphonia and the girl could answer my questions only by movements, tears rolling down her cheeks in utter despair. On the 8th, 9th and 10th she had seven or eight such attacks daily. On the 11th the visiting medical officer suggested a microscopical examination of her stools, which I made. I found that the slide was practically full of *Ascaris*, *Ankylostoma* and a few *Trichuris ova*. Instantly, I myself administered *santonin*, gr. ii, with calomel. In the evening she passed 10 round-worms and the whole picture changed. From the following day she had no more attacks, her speech became normal and she looked much better. On the 16th she was treated with oil of chenopodium and carbon tetrachloride in magnesium sulphate solution, and at present she is performing her ordinary domestic duties which she had been unable to do for 4 months.

The previous diagnosis of dysentery was perhaps based on her passing mucus in the stools, which is so common in *Ascaris* infection, and the first dose of *santonin* did not work as it was probably never given, her husband having been entrusted with the administration.

My thanks are due to our Chief Medical Officer Dr. H. J. H. Spreadbury for his kind permission to publish these notes.

## MULTIPLE MELANOMATA OF THE IRIS.

By J. HANSRAJ, L.M. & S. (Bom.), D.O.M.S. (Lond.),  
*Fatch Manzil, New Queen's Road, Bombay, No. 4.*

TUMOURS of the iris, excepting tuberculous and syphilitic condylomatous growths, are sufficiently rare to be reported.

A man aged 49, came to the Ramwadi Eye Hospital complaining of diminished vision, especially for near work. My Assistant Surgeon, while looking at the eye in the dark-room, noticed something unusual in the lower margin of the left iris and asked me to see the patient. On examination, I found two small blackish-brown tumours springing from the margin of the pupil. The right eye was examined but nothing worth noting was found. The pupils of both eyes reacted quite normally and neither irises revealed any sign of past or present iritis. The tension was absolutely normal. It was decided to examine the patient with Gullstrand's slit-lamp and corneal microscope and with this aim in view I called the patient to my consultation rooms.

*Findings with the slit-lamp and corneal microscope.*—Three small tumours occupied the lower margin of the pupil. One on the extreme left was much bigger than the other two on the right. The first, the largest, was lying practically in apposition to the middle one, and with higher power objective it was seen that a very thin strip consisting of the anterior layers of the iris was lying between the two tumours in the form of a bridge. This strip of iridic layer was thicker towards the left, extremely fine in the middle, and just a little thicker towards the middle tumour. This was the most important diagnostic point as will be described later on, while discussing the differential diagnosis from papules of the iris. The third and the smallest one occupied a position just on the right of the middle tumour, but it was quite separate from the latter. On further examination, three small tumours were found in the upper and inner part of the papillary margin. These were much smaller and less pigmented than the lower

ones. The anterior layers of the iris presented the same pattern as the other parts of the iris, only with the exception that the small spaces in the iris pattern were larger, especially on the largest tumour, suggesting stretching of this layer and supporting the view that the tumour originated from the retinal layer of the iris. On examination of the right eye, I found two small tumours much smaller than those in the left eye—in fact so small as to be almost imperceptible with the ordinary loupe and focussed light—occupying the lower edge. Two others, still smaller, were seen in the upper and outer part of the papillary margin. Besides these tumours no other abnormality could be found either in the anterior chamber, the vitreous or the fundus. The duration of the tumours, as well as the question whether they were stationary or progressing, could not be decided as the patient was absolutely unaware of their existence.

## Diagnosis.

After considering all the pros and cons in favour of and against different conditions which are in certain respects similar to this condition, I came to the conclusion that they were melanomatous growths of the iris. The conditions from which the diagnosis had to be made were (1) papules of the iris, (2) condylomata (3) tubercle, and (4) sarcoma. The points against papules are, stretching of the anterior layer of the iris as is evidenced by a small bridge stretched between the two tumours in the left eye, and the situation of the tumours which is behind the anterior layer, i.e., in the retinal layer of the iris. The points against tubercle are, the age of the patient—tubercle being common in young people only, absence of any signs of reaction such as ciliary injection, exudates in the anterior chamber or in the iris, and the extremely fine constitutional condition of the patient. Besides this, tubercles are not so pigmented as these tumours were.

The question of condylomata can be set aside by taking into consideration the facts that no history of syphilis could be elicited, nor are there any signs or symptoms of venereal disease, such as iritis, posterior synechia, exudation, or atrophy or any other damage to the iris.

Now the only condition that remains to be accounted for is sarcoma of the iris. It is a well-known fact to all ophthalmic surgeons that a benign pigmented growth of the iris takes on a malignant turn at any time and especially after the age of forty. In this particular case, only further examination after a few months will clear up the diagnosis. For the benefit of those medical men who are not specialists in eye diseases, I may state that melanomata of the iris are found in two different forms. The first grows as a blackish tumour from the stroma of the iris into the anterior chamber and arises from the proliferation of the chromatophores of the iris. The second form is seen at the papillary margin of the iris. It develops from the cells of the retinal pigment layer at the spot where it is reflected upon the anterior surface of the iris

at the edge of the pupil. Here, small blackish-brown nodules develop which project into the pupil. These melanomata of the iris are purely benign tumours which reach only a certain size. When they begin to grow beyond the size of a black pepper grain, the question of malignancy has seriously to be considered.

Treatment.

These tumours should better be left undisturbed as long as they are small in size and do not give rise to any signs and symptoms. Sometimes they get detached from the iris and fall into the anterior chamber when they necessitate operation. If they manifest any signs of malignancy, early removal is imperative.

A CASE OF PROBABLE POST-VACCINAL ENCEPHALITIS.

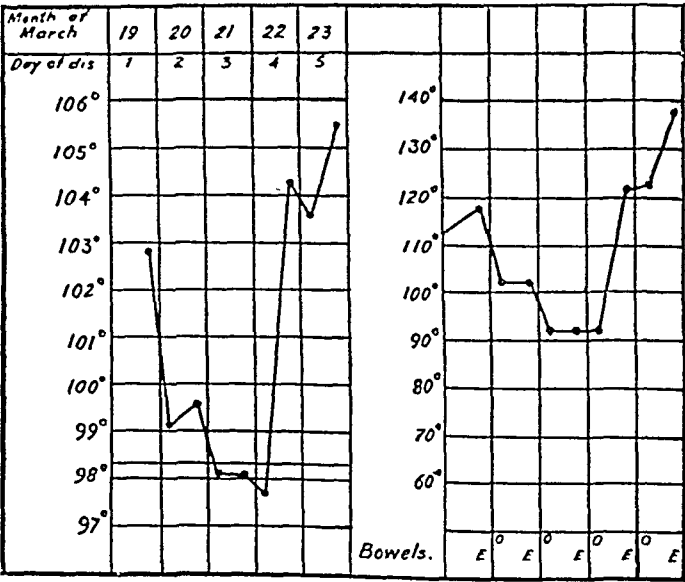
By G. T. WRENCH, M.D. (Lond.),  
Victoria Road, Karachi.

S., a girl of 9 years.

Family History.—The mother died of tuberculosis of the lungs in December, 1929.

Temperature

Pulse



lifted them from the bed to her face. She was neither blind nor deaf. When asked to put out her tongue she moved her lips as if about to do so, but without further result. When asked to give me her hand she raised it and placed it in mine. Otherwise she showed no signs of consciousness. The reflexes including those of the pupils were normal, except the plantar. The response to the lightest touch of either sole was remarkable. There was immediate contraction of all the muscles of the lower limb, the extensors prevailing over the flexors except in the case of the ankle joint. The extensors of the thigh showed a smart visible twitch, while at the same time the adductor tendons and those of the biceps, semi-tendinosus and semi-membranosus could be felt to harden. The Achilles tendon hardened, but its action was exceeded by the flexors of the ankle joint and the extensors of the toes, the tendon of the extensor proprius hallucis standing out notably. There was no Kernig's sign, no stiff neck, and no paralysis. The blood was twice examined for malaria, on the 22nd and 23rd, but no parasites were found. On the 23rd Dr. Shroff, Medical Officer of Health, also saw the case and concurred in the diagnosis. On this day there was no response to requests made. In the evening the temperature rose to 105.6°F. and the patient died. There was no post-mortem.

Dr. Kaikushru, Physician to the Goolbai Maternity Home, kindly permitted me to send this report.

Previous History.—Two months before vaccination, the child had catarrh followed by pneumonia and was in bed 15 days.

Present Illness.—On March 6th she was vaccinated in three places for the first time—a primary vaccination. All three places “took” and followed a normal course.

On March 17th, eleven days after the vaccination was done, she was taken ill with drowsiness, fever, vomiting, and headache. On the 18th she was more drowsy, but responded to a loudly spoken request. I saw her with Dr. Kaikushru on the 22nd in the Goolbai Maternity Home, Karachi. She presented a typical appearance of lethargic encephalitis, of which we had a number of cases some ten years ago. She lay with the eyes open, slightly drooped upper lids, a very slight internal strabismus, normal pupils, a turning of the eyes as if observing things without recognition. There was a fluttering movement of the hands when she

NOTE ON THE OCCURRENCE OF JAUNDICE IN A TUBERCULOUS PATIENT DURING SANOCRYSYN TREATMENT.

By LIEUT.-COL. T. A. HUGHES, M.D., M.R.C.P., D.P.H.,  
I.M.S.,

Professor of Clinical Medicine, King Edward Medical College, Lahore.

Toxic jaundice is rarely seen during the treatment of tuberculosis with sanocrysin. In the reports of the Medical Research Council on this drug, (1925, 1926) two cases are mentioned, one of which ended fatally. In both, the amount of gold salt administered had been 1.5 gm. In the early Danish experiences jaundice was apparently very rare. During recent



years sanocrysin has been used in much smaller doses than it was when first introduced and toxic manifestations are correspondingly milder. Some observations by Malik and myself (1930) showed that small doses of sanocrysin do not usually exert any deleterious effects upon the functions of the liver. In view of these facts the following instance of the occurrence of jaundice during sanocrysin treatment is of interest.

The patient, a female, aged 20, was suffering from extensive chronic pulmonary tuberculosis with rather severe systemic disturbance and numerous tubercle bacilli in the sputum. The resting temperature was irregular and occasionally went as high as 103°F. in the evening. On 28th February, 1930, she was given 0.05 gm. of sanocrysin. There were no untoward effects and the patient began to improve. The temperature fell gradually, the highest point reached three days after the injection being 101°F. On 5th March, 1930, 0.1 gm. was given. There was no discomfort and the improvement was maintained. On 13th March, 1930, the dose was increased to 0.2 gm. The temperature rapidly rose two degrees to 101°F. two hours after the injection, but soon came down again. There were no other symptoms. On 21st March, 1930, a dose of 0.35 gm. was administered at 1 p.m. This made a total dosage of 0.7 gm. One hour after the injection the temperature rose from 98.6°F. to 102.8°F. Albumin was detected in the urine 3 hours later. At 8 p.m. the patient complained of itching all over the body and moderate diarrhoea set in. During the following two days the itching and diarrhoea became worse and jaundice appeared. The urine on the 23rd March, 1930, contained a fair amount of albumin, numerous granular casts and bile. The diarrhoea began to pass off and had disappeared on 25th March, 1930. The itching persisted until about the same date. The jaundice, however, increased in intensity and the liver became enlarged. The urine at first contained urobilin as well as bilirubin and the stools were slightly pigmented. After a few days the stools were free from pigment and urobilin consequently disappeared from the urine. This now contained a large amount of bile pigment. On 29th March, 1930, there were 8 Van den Bergh units of bilirubin in the blood plasma. The pigment gave a "prompt biphasic" reaction. During the following week the jaundice became more marked, the plasma bilirubin rising to 10 units on the 5th April, 1930. The patient felt ill, was nauseated and occasionally vomited. The temperature reached 103°F. to 104°F. in the evenings. The diet was chiefly milk, but as much glucose was given as could be retained. A 10 per cent. solution of sodium thiosulphate was administered as follows:—3 c.c.s. on 31st March, 5 c.c.s. on the 2nd April and 6 c.c.s. on the 4th April, with the object of re-converting the gold into a non-toxic compound. Improvement set in about the 8th April. The temperature became lower (101°F. or so in the evenings), the urine gradually became clearer and pigment began to appear in the stools. On the 13th the plasma bilirubin had fallen to 5 units, still giving a "prompt biphasic" reaction. The urine contained a fair amount of bile-pigment and much urobilin. On the 17th the patient's condition was much better and she was well on the way to recovery. The temperature ranged from normal to 99°F., and the liver had returned to normal size. On the 21st there were 2 units of bilirubin in the plasma.

The type of the Van den Bergh reaction and the variation in pigment excretion as well as the general symptoms indicate that the jaundice was of the toxic variety. It resembled an attack of so-called "catarrhal" or common infective jaundice, but, occurring as it did, during

the course of sanocrysin treatment, a direct toxic action of gold on the liver cells must be considered. Although pigmentation of the conjunctivæ was not seen until two days after the fourth injection, a latent icterus must have been present during this period. It will be noticed that while the first two injections caused no symptoms, fever followed the third and fever, albuminuria and jaundice succeeded the fourth. This series of events suggests a cumulative action of the drug. It is, on the whole, probable that the sanocrysin either caused the condition, or lowered the resistance of the liver cells to some infective or toxic agent. Although small doses of this substance do not usually cause appreciable hepatic injury, the possibility of this occurring should be borne in mind, especially when larger doses are given, or when gastro-intestinal symptoms follow the injections. Under these circumstances the resistance of the liver should be kept up by administering glucose or foods rich in carbohydrates so as to build up a store of glycogen which, as Whipple has shown, exerts a protective action on the hepatic cells.

My thanks are due to Dr. Shujaat Ali, House Physician in our tuberculosis wards, for detailed notes of the case.

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#### GANGLION-LIKE SWELLINGS IN LEPROSY.

By E. MUIR, M.B., Ch.B., M.D. (Edin.), F.R.C.S. (Edin.),  
*Research Worker in Leprosy, School of Tropical Medicine and Hygiene, Calcutta.*

As far as I am aware this condition, which is in my experience fairly common in leprosy, has not been described in medical literature.

The condition described in medical books as *ganglion* is generally situated at the back of the wrist or intercarpal joints. It is a cystic swelling, either hard or soft according to the tension of the fluid contained, and is caused by cystic degeneration of the synovial membrane of either the tendon sheaths or the intercarpal joints. It is generally chronic in character and is seldom accompanied by pain or other inconvenience.

The ganglion-like swellings (*see illustration*) found in leprosy are similar to the above in position, in appearance, and on palpation. Sometimes they are chronic in nature, but at other times they appear suddenly and again as suddenly disappear.

Apparently they are generally, if not always, connected with leprosy disease of the median

nerve. If the disease in this nerve is chronic in nature the swellings continue for a long time. On the other hand I have seen a case in which they appeared suddenly at the same time as a leprous reaction in the median nerves of both hands; as the reaction passed off after a few days the ganglion-like swellings also subsided.



I have not yet had an opportunity of investigating the histology of this condition, and am unable to say to what extent it is due to involvement of the tendon sheaths and to what extent the intercarpal joints are affected, but apparently the condition is due to the latter.

Similar swellings are sometimes noticed in the region of the ankle joint; these occur also in the nerve form of leprosy.

### MARRIAGE FESTIVALS AND THE SPREAD OF CHOLERA.

By S. L. SARKAR, M.A., L.M.S. (Cal.).  
Civil Surgeon, Noakhali.

THE sanitary consciousness of the educated section of the people of this country is being gradually developed. So it may be of benefit if medical officers report instances showing how the habits of people help the spread of cholera epidemics. The following is an illustration, for the materials of which I am indebted to Dr. Nabin Chandra Das Gupta, the medical officer in charge of Joyag dispensary.

There was recently an "epidemic" of marriages in this province. In this connection there was a wedding in the village of Joshna. The guests collected a few days before the date of the wedding. The people of villages are not in the habit of reserving tanks exclusively for drinking water. However, in ordinary times, the human contamination of a tank is slight, and the tank water has the chance of purification from organic impurities caused by bathing, etc., by the natural process of exposure to the sun's rays, and to a certain extent by the oxidation of the impurities. But the case is otherwise when too many people

collect in a village and use the tank both for bathing and drinking purposes. Moreover, when there is a collection of people in a village, there is a chance of a carrier arriving from outside. It appears that something of the kind happened in this case. On the 24th February, which was the day of the marriage, two of the guests were attacked with cholera and died on the 28th.

The occurrence of cholera cases in the village did not cause the postponement of a second marriage in another house for which guests also collected. Two of the guests died of cholera on the day following the wedding in this house also.

A married girl, who was a guest in the latter house, on the 2nd March went to a distant village to her father-in-law's house. On reaching this place she developed cholera and died on the 6th March. A relative went to attend her from a neighbouring village on the 3rd March and, on returning to his home on the 6th, fell sick on the 7th and died of cholera on the 9th March.

### FOREIGN BODY IN THE EAR A CAUSE OF PERSISTENT HICCOUGH.

By M. ABDULLA, L.M.&S. (Hyd.), L.C.P.&S. (Bom.).  
Medical Officer in charge, Municipal Hospital,  
Vanyambadi, North Arcot District.

IN citing this peculiar case of persistent hiccough I wish to emphasise the advisability of thoroughly examining each and every organ that is supplied by the vagus and phrenic nerves, and their various minute branches. Hiccough is sometimes very distressing and may sometimes end in death, not of itself, but by the secondary effects it produces.

Hiccough is a symptom and not a disease, and it is produced as a result of sudden contraction of the diaphragm and glottis subsequently. These contractions are brought about by certain irritant factors. Through the phrenic nerve the diaphragm is made to contract, and through the vagospinal the glottis. In addition to these, numerous peripheral irritations produce hiccoughs, working through the numerous centripetal paths. As a general rule thoracic and abdominal organs, that are mainly or partly supplied by these nerves, are generally at the bottom of the mischief. Hysteria or neurosis, tabes dorsalis, uræmia, and chronic degenerations of the medulla oblongata are rare causes. Meningeal, auricular, pharyngeal and cardiac causes are still more rare, and a foreign body in ear as a cause of persistent hiccough is unheard of.

Mr. M. S., Muslim, aged about 23 years, was suffering from persistent hiccough for about 18 days continuously. Many sedatives, both gastric and nervous, were tried with complete failure, and mechanical interference with movements of the diaphragm, e.g., nose, lips, traction of tongue, abdominal pressure, etc., did no good. Chloroform, brandy, spirits of ammonia, effervescing fluids, bromides and other known hypnotic drugs failed to stop the diaphragmatic spasms. Various injections

such as morphia, atropin, pilocarpin hydrochloride, adrenalin, and blisters over the neck and abdomen only added pain to the misery of the patient. On the 19th day of his disease he was brought to me in a very grave condition. He was very weak and unable to speak due to the incessant and frequent hiccoughs. His pulse was very low, eyeballs sunken, body very much emaciated as a result of want of food. He was cold and clammy and had severe pain in the abdominal muscles. He was free from the trouble while he was asleep, but natural sleep was rare to him. I admitted him in the hospital and examined him thoroughly, and I found no abnormal changes in his abdominal and thoracic organs, excepting that his tongue was very dry and his heart beat though regular was weak. I gave him normal saline with  $\frac{1}{2}$  a c.c. of adrenalin intravenously, and a nutrient enema of milk, eggs with glucose, and a little sodium bicarbonate four hourly. He had not taken food by the mouth since about the commencement of his illness, for swallowing of food was not only impossible but also painful, and if, with some difficulty, he swallowed anything, it would be vomited, adding more pain to the abdominal muscles. For about a day I kept him on morphia gr.  $\frac{1}{4}$  and atropin gr.  $\frac{1}{150}$ . Five injections in all were given to him with no beneficial results and for 3 days afterwards I vainly tried other drugs and at last washed out his stomach. With all my nutrient enemata and various drugs the patient was going downhill. The next morning, that is on the 23rd day of his disease, I examined his throat, mouth and nose and found them normal. In his right ear I saw a small plug of cotton mixed with a little wax. I syringed it out with warm boracic lotion and instilled a few drops of 10 per cent. solution of novocaine. To my surprise the persistent hiccough stopped permanently after about 15 minutes. I kept him under observation for about 2 days more and discharged him on the following day cured.

In connection with the cotton plug I may point out that some Indians, more especially Muslims, are fond of keeping in their ears small plugs of cotton soaked in some Indian scent called "Itter." On enquiry I learnt from the patient that he used a similar plug about two and a half months ago.

I presume that the small piece of cotton mixed with ear wax, becoming hardened, acted like a foreign body in the ear and produced irritation through the auricular branch of the vagus nerve.

## TWO CASES OF PNEUMONIA WITH THROMBOSIS IN THE BRAIN, HAVING A BEARING ON THE PATHOGENESIS OF REMOTE PNEUMOCOCCAL COMPLICATIONS IN PNEUMONIA.

By P. L. DESHMUKH, M.B., B.S.

(From the Pathology School, Grant Medical College, Bombay.)

PNEUMOCOCCAL affections of organs other than the lungs are often found complicating pneumonia. The occurrence of some of these complications like empyema, pericarditis, etc., can be easily explained by direct spread of the inflammatory process to the neighbouring structures. But the pathogenesis of the affection of remote organs like the brain and meninges, joints, cardiac valves, etc., has always been a moot point in the pathology of pneumonia. MacCallum seems to have eluded the point by

saying that "these are the accompaniments of bacteræmia which may occur in the most severe cases towards the fatal termination of the disease (Cole)." Price accepts it as conclusively proved that pneumonia is a septicæmia with predominating pulmonary involvement; while Jockmann believes that bacteræmia is a frequent occurrence in pneumonia and can be demonstrated as such in a large percentage of cases by cultures from the blood, provided large quantities of blood are used for the purpose. Thus it will be found that these complications are not constant accompaniments of bacteræmia. It is also known that amongst these complications the frequency of incidence varies with each. Meningitis is the commonest (1 per cent.), next in order are endocarditis (0.7 per cent.), and arthritis (0.5 per cent.) (Taylor). How then is the occurrence of these complications and the variation in their frequency to be explained?

The following report of two cases of pneumonia suggests an explanation.

*Case 1.*—The patient, a male, aged 50, was admitted from the roadside in a semi-conscious condition with history of fever and pain in the joints. Duration of the complaint was not known. On examination he was found to have pneumonic consolidation of the right apex. Before death the patient showed stiffness of neck with a positive Kernig's sign. He died four days after admission.

Post-mortem revealed the following lesions:—

*Right lung.*—Red hepatization at the apex.

*Heart.*—Engorgement of right side.

*Aorta.*—Atheromatous patches.

*Kidneys.*—Cloudy swelling.

*Spleen.*—Slightly enlarged and soft.

*Pia arachnoid.*—Hyperæmic.

*Brain.*—A hæmorrhagic and softened area about one inch in diameter was found at the tip of the anterior pole of the right temporal lobe, partially involving the insula. No evidence of suppuration was found. Sections of brain showed thrombosis of the vessels (Figs. 1 and 2). No micro-organisms were seen by special staining.

*C. S. Fluid.*—No pus cells or micro-organisms were detected.

*Case 2.*—The patient, a male, aged 30, was admitted for continuous fever, pain in chest, breathlessness and cough of about eight days' duration. On examination signs of consolidation were detected at the right base. Even after the usual period for crisis, i.e., from 7 to 11 days, the patient continued to be acutely ill, with high pulse and respiration rate and remittent temperature. Total white blood cell count showed 8,600 cells per c.mm., and the differential count gave polymorphs 81, lymphocytes 16, hyalines 1, and eosinophiles 2 per cent. The patient was seen the evening previous to his death and no symptoms of cerebral affection were noted. Next day in the early morning the doctor in charge was called upon to see the patient as he was violent. He was found to be unconscious with rigidity of neck and a positive Kernig's sign. Lumbar puncture was done. The cerebro-spinal fluid was under high tension and purulent. Microscopic examination of the fluid showed pus cells and gram-positive diplococci. The patient died the same day, 10 days after admission.

Post-mortem examination revealed the following lesions:—

*Right lung.*—Unresolved pneumonic consolidation was found in the middle lobe.

*Heart.*—Right side, distended.

*Kidneys.*—Hyperæmic.

*Spleen*.—Soft and pulpy.

*Pia arachnoid*.—Yellowish purulent exudate on the surface and at the base.

*Brain*.—There were hemorrhages on the surface and in the substance of the cerebellum. From the previous experience the hemorrhages in the cerebellum were thought to be due to vascular thrombosis. Sections of

the cerebellum showed extensive recent thrombosis with extravasation of red blood cells in the region and evidence of meningeal inflammation (Fig. 3). Pneumococci were seen in sections by special staining.

*C. S. Fluid*.—A large number of pus cells and pneumococci were seen.



Fig. 1.—Showing thrombosis in a cerebral vessel.



Fig. 3.—Showing thrombosis in cerebral vessels.



Fig. 2.—Showing thrombosis in cerebral vessels.

*Discussion*.—The hemorrhagic areas which were seen by the naked eye in the above two cases were found to be associated with thrombosis in the region, which in turn might have been caused by the effect of pneumococcal toxin on the vascular endothelium. Pneumococcal toxin appears to exercise a marked injurious effect on the vascular endothelium of the brain, as in both these cases no evidence of thrombosis or hemorrhage was found in any other organs. The more frequent incidence of pneumococcal complications in this organ than in the any other remote ones supports this view. The reason why a particular part of the brain is selected for the thrombosis to occur cannot be decided.

It was not possible to diagnose the complication clinically in these cases, as there were no symptoms suggestive of any such lesion. It was perhaps due to the great asthenia present at the time when the complication occurred. The positive Kernig's sign and cervical rigidity in Case 1 may be attributed to the phenomena of "meningism" (so often seen in acute infectious diseases) or perhaps to the thrombosis present. In Case 2, delirium and rigidity of the neck were the effects of onset of the meningitis, perhaps irrespective of the

vascular complication, while the relative low white blood cell count was an evidence of lowering of the body resistance at the time of the spread of the infectious process to the brain.

The rapid onset of meningitis in Case 2 cannot pass without notice. Perhaps the sequence of events is as follows:—

The thrombosis is primarily caused by pneumococcal toxin because of its special toxicity towards the vascular endothelium of the brain. As a result of the deficient blood supply the resistance of the part is lowered, together with that of brain of which it is a component part. The pneumococci circulating in the blood thus get an opportunity to attack the brain, culminating ultimately in the clinical picture of meningitis as in Case 2. If death occurred after cerebral thrombosis and before the onset of meningitis from some other cause, e.g., effects of the pneumococcal toxin on the heart muscle, actual meningitis may not develop though the symptoms of meningeal irritation may be present as in Case 1.

The hypothesis of vascular thrombosis previous to the attack of pneumococci would also explain the selection by remote organs in pneumococcal complications of pneumonia, which is now accepted to be a septicæmia from the beginning of the disease. So that other similar complications in pneumonia, like arthritis, endocarditis, etc., can also be explained on a similar hypothetical sequence of thrombosis leading to lowered resistance and consequent attack by the pneumococci circulating in the blood. More cases will be required to confirm the hypothesis which is suggested by the two cases quoted above.

The interest of the cases lies in the following facts:—

1. Thrombosis and hæmorrhage in the brain may occur in pneumonia without any obvious clinical symptoms.

2. Pneumococcal toxin appears to have a special toxicity towards the vascular endothelium of the brain.

3. In pneumonia vascular thrombosis and hæmorrhage in the brain may occur as a complication without meningitis as in Case 1, and perhaps precede meningitis when it complicates pneumonia as in Case 2.

4. It would appear that the susceptibility of the vascular endothelium of a particular organ for thrombosis under the influence of pneumococcal toxin may determine the occurrence of pneumococcal complication in that organ in pneumococcal septicæmia.

My sincere thanks are due to Dr. R. Row, Professor of Pathology, for the kind permission he has given me to report these cases, and to Professor Row and Dr. J. L. Saldanha for their help and guidance in writing this paper.

## A CASE OF LATENT TYPHOID FEVER.

By CAPTAIN A. ROY CHOUDHURY, M.B. (Cal.), B.Sc.

*Lady Hardinge Road, New Delhi.*

I WAS called in, on the 22nd March at 3 p.m., to see a patient having the history of passing a large black coloured stool about 15 minutes before, and of repeated vomiting.

The patient was a thinly built girl, aged about 13 years, looking extremely pale, and breathing quickly. She was fully conscious and complained of pain in the abdomen in general and in the umbilical region in particular. Her pulse was soft, thready and running at the rate of 130 per minute. Temperature 97° (oral). Tongue—slightly coated and dry. Extremities somewhat cold. Abdomen—stiff and tender. She would hardly allow me to touch a spot about an inch above and to the right side of the umbilicus. Spleen—just palpable; liver—not enlarged. On enquiry I found that the girl had not felt well and had no desire for food for about a week preceding the attack of hæmorrhage. There was no history of fever. She was on her usual diet up to the time I saw her.

There was no history, or any symptoms pointing to previous gastric or duodenal trouble. The stool was preserved for my inspection. It was a large tarry stool without any faecal matter. Once she vomited in my presence. The vomited matter was composed of undigested food particles and mucus. An injection of 2 c.c. of 10 per cent. calcium chloride solution was given intravenously and an ice bag was ordered to be placed on abdomen. She was advised to suck small pieces of ice. An injection of morphia was given in the night at 10 p.m. The next day her blood was taken for the Widal reaction which was positive—1 in 100. The urine was also examined next day; there was no albumin. She had a motion after 48 hours as a result of a glycerin enema. The stool was small in amount and tarry. Subsequently she made an uneventful recovery.

Points of interest are (1) one of the dangerous complications appeared as the first symptoms in this case. (2) Difficulty in diagnosing the condition owing to the remarkable absence of symptoms and signs previous to the onset of the complication. (3) Effectiveness of intravenous injection of calcium chloride as a measure against internal hæmorrhage.

## ELIMINATION OF URIC ACID VIA THE SKIN.

By J. L. SALDANHA, M.B., B.S. (Bombay).

A MALE, aged 60, cleric by profession, sought advice for troublesome and incessant pruritus of three years' standing, limited to dark-brown irregular patches of various sizes on his trunk and extremities. There were shining crystalline incrustations over these patches. The patient had been continually under the treatment of several qualified practitioners without finding any appreciable relief. He was unable to secure more than three hours' sleep at nights

on account of the itching, for the previous three years. Apart from slight hypertrophy of the heart and a systolic blood pressure of 150 mm., physical examination was negative. Urine:—sp. gr. 1010, urea 1.8 per cent., uric acid 0.01 per cent., and stray hyaline casts. Ruhemann's test was carried out for the estimation of the uric acid content.

As the uric acid content of the urine was low it was thought that the patches might be an effort on the part of the system to eliminate it via the skin.

On this hypothesis Atophan 7½ grs. twice daily was prescribed. The itching came under control on the third day after commencing the treatment; the patches also began to clear on the third day and cleared up completely on the 7th day.

He was advised to take an occasional course of Atophan as indicated; he has had no recurrence of the trouble since 1925. Sleeps well; had an attack of epistaxis last year; feels all the better for the same and is able to lead an active life.

I would be pleased to hear from medical men if they have had a parallel case. It would appear that the uric acid, on administration of Atophan was eliminated through the normal channel of excretion, i.e., via the kidneys.

## TRANSIENT GLYCOSURIA OF DOUBTFUL ORIGIN.

By RABINDRA NATH CHATTERJEE, M.B.,  
Senior House Physician, Medical College Hospitals,  
Calcutta.

On the morning of the 2nd April last, an unconscious man, picked up from the street, was brought in by ambulance to the emergency ward of the Medical College Hospitals.

*Condition on admission in the in-door ward.*—Patient lying deeply unconscious, having recurrent convulsions strictly limited to the upper part of the body—with complete relaxations of the body in between. Pupils dilated and equal; temperature sub-normal, P/R—100/24 per minute. Breath—foul: no smell of alcohol or opium.

*Physical examination.*—No marks of external injury, no signs of fracture, and no bleeding from external apertures. A marginal corneal ulcer present on the left eye. Lungs and heart—quite normal. Spleen and liver—not enlarged. No stiffness of muscles, Kernig's sign—negative. Knee jerks—exaggerated. Babinski's sign—positive.

### Laboratory findings.—

#### Blood-pressure:—

Systolic	..	..	115 mm.
Diastolic	..	..	80 mm.

#### Blood:—

Total and differential count—normal.  
No malarial parasites.  
Blood-culture—sterile.  
Widal reaction—negative.  
Wassermann reaction—moderately positive.  
Blood sugar (2-4-30)—0.18 per cent.  
Blood sugar (3-4-30)—0.1 per cent.  
Blood urea—0.025 per cent.  
Non-protein nitrogen—0.042 per cent.  
Glucose tolerance test (7-4-30)—a normal curve with no glycosuria.

#### Urine:—

2-4-30. Albumin—a trace.  
8 a.m. Sugar—present, copious.  
Quantitative estimation of sugar—  
6 per cent.  
Acetone—Nil.  
4 p.m. Sugar—Nil.  
From 3-4-30. Till discharge, urine sugar—  
free.

Urine culture—no growth.

#### Cerebro-spinal fluid:—

Pressure—normal.  
Character—clear.  
Globulin test—positive.  
Sugar content—normal.  
Cytological examination—nothing abnormal.  
Culture—negative.

#### Patient's condition as noted day by day:—

2-4-30. The patient was given an intramuscular injection of insulin, 20 units—an hour later he developed symptoms of hypoglycemia which passed off after an intravenous injection of glucose (25 per cent.)—25 c.c., and adrenaline subcutaneously.

In the evening the catheter specimen of urine was found to be sugar free—the patient's condition still remaining unchanged with an additional symptom of high temperature of 102.5°F.

3-4-30. Having similar convulsions but at longer intervals—deeply unconscious—nasal feeds. Temperature—103°F. P/R—110/24. Lungs and heart—normal. Corneal ulcer present.

4-4-30. No convulsions, conscious at times. Oral feeds. Temperature—102°F. Corneal ulcer improving.

5-4-30. Patient conscious but talks incoherently. Temperature—100°F. P/R—90/22. Shows signs of some mental derangement.

6-4-30. Temperature—normal. Memory returned. Gave out his identity. No complaints.

On enquiry from the patient, it was learnt that he was living with a woman of the town but he could not (? did not) tell us what happened to him the night before he was found lying unconscious on the pavement.

The object of my publishing this detailed note of the case is to have some reasonable explanation for this temporary glycosuria.

It could not have been a case of renal or alimentary glycosuria. Had it been a case of leaky kidney—why should the sugar disappear mysteriously, being present for a single time in only one sample of urine? As to the alimentary type, the patient never passed a single grain of sugar even after a hearty meal.

A pontine lesion was out of the question in this case—there being no evidence of paralysis of the 5th, 6th, and 7th, cranial nerves or any part of the body. There was no conjugate deviation of the eyes, no contraction of the pupils, the only point in favour being the high temperature, which the patient had several hours after his admission. Phloridzin is a substance which might cause glycosuria, but its use is chiefly in the hands of medical men.

Could the man have been drugged, which seems to be possible in this particular case, but still what drug has got the property of causing glycosuria?

It would be highly appreciated if any member of our profession could make out a reasonable solution of this problem which still remains a mystery to us.



My thanks are due to Dr. B. L. Majumdar, Additional Physician, Medical College Hospitals for kindly allowing me to publish this note.

### A CASE OF "SCURVY."

By R. C. SRIVASTAVA, B.Sc., M.B., B.S.,  
Roorkee.

A HINDU patient, male, aged 65 years, from a village in Saharanpur district, came to me complaining of continuous bleeding from the gums for the last 15 days.

*Family history.*—No history of bleeding among his family or his mother's relatives.

*Personal history.*—He had received injuries several times but the bleeding was never profuse.

*History of present illness.*—About a fortnight previously the patient noticed slight bleeding from the gums, on rubbing them. The bleeding increased and the gums began to swell and he was advised by his local *vaid*s and *hakims* to apply leeches; this was done but it made matters worse. When he saw me the bleeding was continuous.

The patient was much run down in health and could not talk properly as saliva and blood were coming out continuously. The eyes were pale and sunken and the breath foul.

*Physical examination.*—The lips were quite normal. The teeth were dirty. *Pyorrhœa alveolaris* was present. The gums in general were swollen, but those in connection with the lower right incisor and upper left canine appeared to be in a condition of hypertrophy, and the corresponding teeth appeared to be buried in a mass of soft fungous tissue of purplish tint. There was a constant discharge of sanious fluid imparting a fœtid odour to the breath. The teeth were examined and they were found to be fairly firm excepting the two mentioned, which were loose. There were no subcutaneous hæmorrhages.

Tongue and pharynx were quite normal.

Spleen and liver not palpable.

Other systems normal.

*Blood examination.*—Blood films showed signs of secondary anaemia, viz., poikilocytosis and anisocytosis were present. The total red count was 2,750,000.

Total W. B. C.	..	..	8,000
Hæmoglobin	..	..	65%

*Diagnosis.*—The possibilities were:—

- (a) Scurvy.
- (b) *Pyorrhœa alveolaris* (severe form).
- (c) *Hæmophilia*.
- (d) Acute lymphatic leukæmia.
- (e) Mercurial poisoning.

The total W. B. C. count was about the normal and the typical non-granular lymphocytes which are characteristic of acute lymphatic leukæmia and form 70 to 99 per cent. of the leucocytes were conspicuous by their absence.

The history of previous injuries without much bleeding was sufficient to exclude hæmophilia.

There was no history of having taken mercury in any form.

Simple *pyorrhœa* was insufficient to explain so excessive a bleeding.

*Treatment.*—On the first day the patient had gargles of hydrogen peroxide every hour, local application of adrenalin chloride 1:1000, injections of horse serum 10 c.c., and calcium lactate 15 grains thrice daily, but with no result. In the evening half a dozen oranges in addition to above treatment reduced the bleeding by half.

On second day one and a half dozen oranges without any medicinal treatment almost stopped the bleeding.

He then went back to his village and returned to me with severe epistaxis after a week. On enquiry it was found that he had stopped the oranges after leaving me. I advised him to take fresh fruits and green vegetables daily in some form, and I have not heard of him for over two months so I presume he is cured. The rapid improvement following the administration of oranges was in itself quite sufficient to establish the diagnosis of scurvy. This disease is rarely seen in civil life and especially in one member of a large family, but on careful enquiry it was found that this man had never taken any fresh fruit or green vegetables for the last two years, though other members of his family had been using them in some form or other.

### A CASE OF MYIASIS OF THE NASAL FOSSA.

By P. K. KURUP, L.M.P.S. (Bom.), M.R.C.P. & S. (India),  
Medical Officer, Teliparamba, Malabar.

A FEMALE COOLIE, aged 60, came to me with a complaint of swelling, epistaxis, pain, irritation and a gnawing sensation in the nose. The epistaxis started three days ago and the day on which she came to me she said she passed a worm from her nose.

She gave a history of a discharge from the nose for the past 20 years.

Irrigation of the nasal cavities with carbolic lotion was performed without any success. Irrigation with turpentine and warm water was performed with a little success. A few worms came out. The patient's agony and the gnawing sensation were great, indicating that the larvæ were very active and trying to escape from the turpentine. She was then given the following lotion.

Chloroform	..	..	m. 30
Oleum eucalyptus	..	..	m. 30
Camphor	..	..	grs. 30
Aqua destillata	..	..	oz. $\frac{1}{2}$

The nose was plugged with a piece of cotton wool soaked in the above lotion, and the next morning she said that 5 "worms" had come out of her nose but she was not completely free from pain. The nose was irrigated with a solution of chloroform in water about double the strength of aqua chloroformi B. P. and more worms were evacuated, after which the patient recovered completely.

The larvæ were sent to the Calcutta School of Tropical Medicine and Hygiene where they were identified as those of *Chrysomya mezziana*.

# Indian Medical Gazette.

AUGUST.

## THE INFECTIVITY OF MALARIA CARRIERS.

THE degree of infectivity of persons harbouring malarial gametocytes to the transmitting anopheline mosquitoes has long constituted a problem in malariology on which study was much needed. In this connection there has recently been published\* by Dr. R. Green of the Malaria Research Division, the Institute for Medical Research, Kuala Lumpur, F. M. S., a report of very considerable interest (*Bulletin No. 5 of 1929*).

The questions which the author sought to answer may be summarised as follows:—

(i) What is the minimum number of gametocytes for each species that must be present in the patient's blood in order that the mosquito may become infected?

(ii) When is it safe, from an epidemiological point of view, to discharge a malaria patient from hospital after treatment?

(iii) In carrying out a parasite survey, what proportion of cases investigated are capable of infecting the locally associated anopheline mosquitoes?

(iv) Does quinine cause the gametocytes to disappear rapidly enough to render the patient non-infective within a short period?

(v) If sufficient gametocytes are present in the patient's blood to infect the mosquito in the ordinary course of events, will quinine administration affect the infectivity of these gametocytes to the mosquito?

The experiments were carried out between February and August 1929. In all 83 male patients were selected out of 614 examined, for mosquito feeds; 20 with gametocytes of *P. vivax*, 21 with gametocytes of *P. malariae*, and 39 with gametocytes of *P. falciparum*.

As soon as the mosquitoes had finished feeding on the gametocyte carriers, blood films were taken from the patients, and the following data determined:—

(i) Number of gametocytes per 100 leucocytes.

(ii) Number of gametocytes per c.mm. of blood (using Sinton's fowl corpuscle method of counting).

(iii) Proportion of male to female gametocytes.

(iv) Proportion of young or abnormal forms of gametocytes.

(v) Number of leucocytes per c.mm. of blood.

(vi) Presence of trophozoites and their relative numbers.

(vii) The history of previous quinine administration, the urine being examined with Mayer's reagent.

(viii) The patient's temperature at the time of the feed; if afebrile, the period since the last attack of fever.

(ix) The hæmoglobin percentage; degree of splenic enlargement; and the blood group to which the patient belonged.

The mosquito chosen was *Anopheles maculatus*, since it has been proved by Stanton and others that this species is a ready transmitter, and also it is the principal carrier in the inland districts of Malaya. During the period of the experiments the atmospheric temperature ranged from 70.5°F. to 91.2°F.; and the relative humidity from 46.6 per cent. to 90.5 per cent.—the mean of the latter being 71.3 per cent. Mosquitoes were dissected (a) at the 7th day, and examined for oöcysts; and (b) at the 16th to 18th day, and examined for oöcysts and sporozoites. In all 1,130 *A. maculatus* were fed on 113 occasions, all being given a single feed only; of these 890 or 77 per cent. took a blood meal—a good indication of the readiness with which this species feeds on man. Some 3.8 per cent. of those which fed died before a suitable dissection period, but ultimately 847 were dissected and examined. The results obtained are discussed under three main headings; the numerical factors concerned; factors in the gametocyte carrier other than numerical; and the influence of quinine.

Taking the numerical factor first, with *P. vivax* oöcysts were found in 75 per cent. of the infected mosquitoes, and sporozoites in 62.5 per cent. The minimum infection in the patient's blood which caused infectivity in the mosquito was 1 gametocyte per 1,000 leucocytes, or 10 per c.mm. of blood. With *P. malariae* results were unexpected. Of two batches of mosquitoes fed on patients with quartan malaria, an average number of 7 survived for dissection, and of these an average number of 1.5 became infected and showed immature oöcysts. No sporozoites were found at any time, however. The average number of gametocytes in the patient's blood was 76.4 per c.mm. It is clear that *A. maculatus* can become infected in nature with *P. malariae*, but further experiment is necessary before it can be assumed that this species will transmit quartan malaria with certainty. With *P. falciparum* 82.7 per cent. of infected mosquitoes showed oöcysts, and 74.3 per cent. sporozoites. The average number of gametocytes present in the blood of the infective human hosts was 415 per c.mm.

\*Observations on some factors influencing the infectivity of malarial gamete carriers in Malaya to *Anopheles maculatus*. *Bulletins from the Institute for Medical Research, F. M. S., No. 5 of 1929*.

The following tabular statement summarises the numerical findings:—

	AVERAGE NUMBER OF GAMETOCYTES PER C.M.M. OF BLOOD.		
	<i>P. vivax.</i>	<i>P. malaria.</i>	<i>P. falciparum.</i>
Positive cases.	142.3	97.5	1,281.0
Negative cases (i.e., those which failed to infect the mosquitoes).	177.3	76.4	414.9

Turning next to factors other than numerical which may affect the infectivity of the human host to the mosquito, the first point studied was the relationship of the sexes of the gametocytes in the "positive" and "negative" human hosts respectively. Here very wide variations were found; it is concluded in general that in the case of *P. vivax* there was some evidence that the patient was less infective to the mosquito when female gametocytes were greatly in excess of males; in the case of the other two species the evidence was inconclusive.

In malignant tertian malaria, where the number of gametocytes is approaching the minimum infective limit, there was some evidence to show that a high proportion of young or abnormal forms reduced the infectivity of the human carrier to the mosquito. The presence or absence of fever in the patient at the time of the feed did not appear to affect his infectivity. The presence of trophozoites together with gametocytes did not reduce the infectivity of the latter. With regard to hæmoglobin content, mosquitoes feeding on anæmic patients became as readily infected as those feeding on persons with a normal hæmoglobin percentage. The size of the spleen bears no relationship to the number of gametocyte carriers amongst those examined, and in survey work the spleen rate will afford no indication of the infectivity rate of the population towards the local anophelines. Enlargement of the spleen was actually more common among the patients which failed to infect mosquitoes. A high leucocyte count at the time of feeding did not diminish the infectivity of the carrier to the mosquito. Persons of different blood groups behaved alike with regard to their infectivity to the mosquito.

Much of the work reported on in this second section of the memoir had negative results; but it was essential that these points should be investigated, and the negative results obtained are of value in clearing up debated questions.

Turning to the influence of quinine on the patient's infectivity, it is clear that quinine might either reduce the number of the gametocytes, or their viability in the mosquito, or might affect both factors. Taking the first factor, it is well known that quinine administration rapidly kills the gametocytes of *P. vivax*

and *P. malaria*. With *P. falciparum* the case is quite different, and—in common with several previous observers—Dr. Green finds an increased output of crescents in patients who have had quinine treatment; in a group of 250 cases of malignant tertian malaria studied, 50.4 per cent. showed crescents on admission, but 64 per cent. showed crescents after an average period of 7 days' quinization. (Whether quinine administration actually drives more crescents into the peripheral circulation, or whether the apparent correlation is a spurious one, due simply to the maturing of crescents derived from trophozoites which were present before quinine was administered, is a point upon which no research worker as yet appears to have brought forward any clear evidence.)

With regard to the effect of quinine on the viability of the gametocytes *vis-à-vis* the mosquito, Dr. Green's findings are important. They are as follows:—

(i) "With *P. vivax* gamete carriers the viability of the gametes is not affected by the usual doses of quinine given up to 24 hours previously. It is probable, however, that continued quinine treatment reduces the number of these gametes sufficiently rapidly to render quinine of epidemiological value."

(ii) "Where carriers of quartan gametes are concerned, quinine treatment in doses of gr. x given up to two hours prior to the mosquitoes feeding on the patient does not affect the viability of the gametes, which in *A. maculatus* will conjugate and develop at least as far as the oöcyst stage. As with benign tertian gamete cases, however, the effect of quinine in reducing the number of quartan gametes is thought to be sufficiently rapid to render the patient uninfected to mosquitoes within a fairly short period.... The use of quinine in ridding patients of benign tertian and quartan gametes requires further investigation before minimum periods of treatment may be laid down."

(iii) "In the case of *P. falciparum* gamete carriers undergoing the standard quinine treatment generally adopted in Malaya (gr. x thrice daily) the rate of reduction of the gametes is slow and somewhat irregular, and the viability of the gametes is not affected by quinine given up to two hours prior to mosquitoes feeding on these cases. Patients receiving full quinine treatment (and absorbing it, as proved by examination of the urine) may still be infective to *A. maculatus* in their hospital ward or elsewhere up to the 16th day."

(In spite of this last finding, we wonder how many cases of malignant tertian malaria are treated annually in hospitals in India with quinine, without mosquito nets being used to prevent their infecting the local anophelines.)

The second half of Dr. Green's memoir is devoted to a discussion of the application of the

results obtained. We have seen that the minimum gametocyte rates for infectivity are for *P. vivax* 10, for *P. malariae* 27, and for *P. falciparum* 42 gametocytes per c.mm. of blood. What standard of blood examination will enable the laboratory worker to determine whether a gametocyte carrier is or is not infective to a mosquito? The author suggests that patients should not be discharged from hospital until thick blood films, each examined for five minutes, on three alternate days are found negative and gametocyte-free. For crescent carriers a combination of 0.01 grm. of plasmoquine plus gr. v of quinine per kilo of body-weight is recommended. "The foregoing experiments afford some proof of the local epidemiological limitations of quinine" he writes. "No sense of security in the belief that (without thorough microscopical examination of the blood) because the patient is receiving or has received quinine treatment, he is no longer a source of infection, is justified in the light of these results." And he stresses the necessity for protecting malaria patients in hospital with mosquito nets, and for anti-larval measures in the neighbourhood of hospitals and dispensaries.

Finally comes a discussion on the practicability of reduction in the number of gametocyte carriers as an anti-malarial measure. First, such a policy is desirable; and in wide stretches of rural country where anti-larval measures are out of the question, it may be the only policy possible. The United Fruit Co. in Central America urges that no patient shall be discharged from hospital until he is gametocyte-free. In some countries malignant tertian malaria may be prevalent all the year round, and a most interesting chart is given showing that in Malaya potentially infective crescent carriers are to be encountered at all times of the year. The control of gametocyte carriers at least deserves consideration as an anti-malarial measure.

Appendices to the report deal with the technique of parasite counts and methods of staining films; with mosquito dissections, and findings of interest other than malarial infections. In a batch of mosquitoes fed on a patient with a mixed infection with *P. vivax* and *P. falciparum* oöcysts of both species were found in different mosquitoes of the same batch. Mr. B. A. R. Gater, Entomologist to the Institute, contributes an appendix on the technique of breeding and using laboratory-bred *A. maculatus* in such experimental work.

Dr. Green's report is full of interest, and should be read in the original by all workers in malaria. The report is also valuable for its discussion of the work of previous observers, and for its fairly extensive bibliography of 40 references. His final conclusions are as follows:—

#### Conclusions.

(i) *A. maculatus* is susceptible to infection with *P. falciparum* and *P. vivax*; and is capable of transmitting both sub-tertian and benign tertian malaria. Oöcysts but no sporozoites were found in the case of *P. malariae* and no conclusion is made regarding the transmitting of quartan malaria by this mosquito.

(ii) The stated minimum number of gametes necessary to infect *A. maculatus* may be regarded as a guide in deciding whether a patient is capable of infecting this mosquito. Five minutes' examination of a thick blood film from the patient should be sufficient to determine this point.

(iii) Factors in the gamete carrier other than numerical as described, taken singly or collectively, appear to be of little practical value when deciding whether a patient is infective to mosquitoes.

(iv) If a thorough microscopical examination of the blood is not possible, patients with sub-tertian malaria while undergoing quinine treatment may be regarded as potentially infective to *A. maculatus* up to the sixteenth day.

(v) The viability of the gametes of *P. falciparum* is not affected by past or recent quinine treatment. As distinct from reducing the number of gametes in the blood, it is somewhat doubtful whether, in addition, quinine affects the viability of the gametes of *P. vivax* and *P. malariae*.

#### "PSITTACOSIS." A CORRIGENDUM.

In connection with our editorial on psittacosis on p. 277 of our issue for May 1930, we have received a letter from Mr. H. Cooper, M.R.C.V.S., of the Imperial Institute of Veterinary Research, Muktesar, dated the 31st May, 1930, which corrects mistakes made in that editorial. It is clear from Mr. Cooper's letter that there are two entirely different epidemic diseases of fowls, quite apart from psittacosis of birds. These are: (i) fowl plague or fowl pest, which has long been known; and (ii) the new epidemic disease of fowls due to a filterable virus, which appeared almost simultaneously in 1926-1927 in areas as far apart as England, Java, the Philippines, and India, and has been variously termed "Newcastle disease of fowls" and "Ranikhet disease." These two have been muddled up in the literature, and the present writer was misled into considering them to be one and the same disease. Mr. Cooper's letter makes the position clear. It is as follows:—

"We have recently read the valuable contribution upon psittacosis in the editorial in the *Indian Medical Gazette*, May 1930, Vol. LXV, No. 5, pp. 277-280. Both Mr. Ware and myself have been struck by what appear to be some inaccuracies in names that are, we think, apt to be misleading if left uncorrected. The confusion arises in the similarity of the names given by some authors to the new disease of fowls due to a filter-passing organism and the disease fowl plague. As you are aware Doyle (1927) first described the newer disease, calling it for purposes of description in his article 'Newcastle disease.' He proved in his experiments quite conclusively that it was a disease due to a quite different virus from that which causes fowl plague. Fowl plague is sometimes referred to also as fowl pest, and it is somewhat unfortunate that Picard (1928), working in Java, should have chosen to call the condition he was working upon 'pseudo-fowlpest,' having shown that the virus was different from that responsible for true fowl plague. The confusion became more marked when Rodier (1928), working in the Philippines, suggested the name 'avian pest' for what appeared to be the same disease as that described both by Doyle and Picard. The disease worked upon in India at this Institute was called tentatively by Edwards (1928) 'Ranikhet disease' until such time as it had been definitely identified.

Last year I obtained from Rodier a sample of both his Philippine virus and Doyle's 'Newcastle disease' virus, and in all comparative tests made it appears that

there is no difference, in any case immunologically, between them and our Indian virus of 'Ranikhet disease.' Just recently also, I have obtained a sample of Picard's virus from Java, and here again in the few tests carried out there is every indication that it also is identical with the other three viruses. It seems clear, therefore, that the time has arrived when a new and distinct name must be found for this new fowl disease, in order to prevent further confusion in nomenclature with fowl plague.

The inaccuracies in the editorial referred to above to which we want to draw your attention are:—

(1) On page 279, half-way down the left hand column, reference is made to the question raised by Bedson, Western and Simpson to a possible relationship between psittacosis and 'fowl plague,' yet in mentioning again the same reference on page 280, it is stated that the suggested relationship is between psittacosis and 'avian pest.'

(2) On page 279, when mention is first made of the 'mysterious epidemic malady of fowls,' the 'various names' quoted are 'Newcastle disease of fowls,' 'pseudo-fowlpest' and 'avian plague'; 'avian pest' is evidently meant here.

(3) It is again somewhat misleading in the same paragraph referred to above, when the editorial states that the disease known by the names quoted above 'has long been known,' and then goes on to refer to 'Ranikhet disease' having appeared in India in 1927. The suggestion there is that the diseases first mentioned are related to the disease which has been known to exist for a long time, namely, fowl plague, and that 'Ranikhet disease' appeared as a new and distinct entity suddenly and as recently as in 1927. The actual facts are that each of the outbreaks in England, Java, Philippines and India occurred within the space of one year 1926-1927, as very sudden epizootics which have been proved to be quite distinct from fowl plague, the only disease of this kind in fowls which has 'long been known.'

We shall be glad if you will please make what use you think fit of the facts stated in this letter."

#### "THE EVOLUTION OF MEDICAL PROTO-ZOOLOGY." A CORRIGENDUM.

In connection with the sectional presidential address to the Medical and Veterinary Research Section of the Indian Science Congress, 1930, by Lieut.-Col. R. Knowles, I.M.S.,—published in our issue for January 1930—we have received a letter from Sir Aldo Castellani, K.C.M.G., F.R.C.P., pointing out that his discovery of trypanosomes in the cerebro-spinal fluid of cases of sleeping sickness has been overlooked in that address. We regret very much that so important a contribution to the literature should have been omitted, but the address dealt rather with Bruce's earlier work. The true sequence of events—as far as we can gather from a perusal of the literature, and from the enclosures to Sir Aldo Castellani's letter—was as follows:—

1841. Valentin was the first to discover a trypanosome, that of the trout.

1878. Lewis in Calcutta discovered a blood-inhabiting trypanosome of warm-blooded hosts—now known as *Trypanosoma lewisi* of the rat. It is non-pathogenic.

1880. Evans in the Punjab discovered the first known pathogenic trypanosome, the parasite of surra—now known as *Trypanosoma evansi*.

May 1896. Bruce's final report on nagana was posted to London, and published in 1897. In it he showed that nagana is due to a blood-inhabiting trypanosome—now known as *Trypanosoma brucei*; proved its harmlessness to wild game but pathogenicity to domestic animals; and the transmission of the disease by Glossina flies. (He believed that the transmission of nagana was direct, however, via the proboscis of the infected fly.)

May 1902. The first Sleeping Sickness Commission of the Royal Society was sent out to Central Africa. (It is almost impossible at the present date to dig out information with regard to the personnel of the Royal Society's Commission, for it changed a good deal at different dates. The *Proceedings* concerned are only

available in Calcutta in part, and are incomplete.) Dr. Castellani was a member of this First Commission.

1902. Ford, working on the Gambia coast, discovered a trypanosome in the blood of a patient suffering from what he considered to be an undetermined type of fever. He sent his material to Dutton at the Liverpool School of Tropical Medicine. The latter confirmed the discovery of this trypanosome, and published a note on it, naming it *Trypanosoma gambiense*.

Ford and Dutton did not know that they were dealing with sleeping sickness. They called the disease 'Gambia fever.' A little later Laveran called it 'Dutton's fever.'

12th Nov., 1902. Castellani, whilst examining the centrifuged deposit from cerebro-spinal fluid from a case of sleeping sickness (in order to determine the leucocyte formula of that fluid in sleeping sickness), observed a living trypanosome in this deposit.

November 1902—March 1903. Castellani, working on the same lines, discovered the same trypanosome in the cerebro-spinal fluid of 5 out of 15 cases examined. He suggests as a working hypothesis "that sleeping sickness is due to the species of trypanosome I have found in the cerebro-spinal fluid of the patients in this disease."

March 1903. Dr. (now Sir David) Bruce, Capt. Greig, I.M.S., and Dr. N. Nabarro, sent out by the Royal Society, arrive at Entebbe. Dr. Castellani reports his finding to Dr. Bruce, but asks that it be kept from Dr. Nabarro (confirmed by Dr. Nabarro's letter in the *British Medical Journal*, October 6th, 1917).

Dr. Castellani remains for three weeks with the new Commission before sailing for England. During this time the same trypanosome is found in the cerebro-spinal fluid of 70 per cent. of 29 cases examined (presumably in 20 patients).

Dr. Castellani then leaves for England.

May 1903. Castellani publishes his findings in the *British Medical Journal*. The Commission (Bruce, Greig and Nabarro) in their first report mention that "Dr. Castellani, we presume, has already published these results. After his departure the Commission continued to pursue this line of work."

May 1903. Professor Kruse refers in a published paper to Castellani's finding of the trypanosome.

1913. Letter from the late Dr. A. J. Chalmers published in the *Times* (20th September, 1913) in which he makes the following quotation from the 4th Report of the Sleeping Sickness Commission:—

"This most interesting discovery of Dr. Castellani's which was due to his introduction of the method of centrifuging the cerebro-spinal fluid in his search for streptococcus, has been of the utmost possible value to the Commission. It put them at once on the right track and led to the rapid and easy establishment of the aetiology of this hitherto mysterious disease."

"A knowledge of his observation they might have worked for months in the dark, and in truth might even have returned to England still ignorant as to the true cause of the disease."

1926. Letter from Sir Ronald Ross in the *Journal of Tropical Medicine and Hygiene*, 1st October, 1926, in which he quotes the above paragraph, and concludes—

"There cannot be any doubt that the fundamental discovery in the elucidation of the aetiology of sleeping sickness was Castellani's observation of trypanosomes in the spinal fluid of sleeping sickness patients, and one cannot see why there has been so much discussion on the matter."

A perusal of the above facts leads us to the following conclusions:—

(i) Ford was the person who first discovered *Trypanosoma gambiense* (1902).

(ii) Castellani (1903) first discovered the same parasite in the cerebro-spinal fluid of patients suffering from sleeping sickness, and published that finding, suggesting in his conclusions that the trypanosome might be the true causative agent of the disease.

These two facts, however, do not detract from the great merit of Bruce's earlier work on nagana, nor from the splendid success of the Commission in finally working out the transmission cycle in Glossina flies

under Bruce's most capable and brilliant leadership. (The present writer has not the pleasure of personal acquaintance with any of the parties concerned in the controversy, but one member of the Commission has informed him that "if it had not been for the way in which Bruce kept our noses to the grindstone and would not allow any divergence into side tracks, the thing would never have been got out.") Also presumably Bruce assisted Dr. Castellani in his examination of the cerebro-spinal fluid of the further 29 cases studied in March 1903, and confirmed his findings before publication of the latter's paper. It is to be noted that in his paper Dr. Castellani had not entirely given up the streptococcus theory, for he writes:—

"I would suggest as a working hypothesis on which to base further investigations that sleeping-sickness is due to the species of trypanosome I have found in the cerebro-spinal fluid of the patients in this disease, and that at least in the last stages there is a concomitant streptococcus infection which plays a certain part in the course of the disease."

It is impossible for a worker in India to pass any judgment, except upon published facts. We may summarise the situation by quoting again Dr. Chalmers' letter of 1913 to the *Times*:—

"Let us not attempt to detract from either of these great benefactors of the human race, but give to each of them the honour due to himself." R. K.

## Medical News.

### SOME INTERESTING CASES.

A CLINICAL MEETING of the Calcutta Branch of the British Medical Association was held on Friday, June 13th, 1930, at 6-15 p.m. in the lecture theatre of the Calcutta School of Tropical Medicine.

Lieut.-Col. J. A. Shorten, I.M.S., M.R.C.P. (Lond.), showed the following cases:—

Case 1.—A European male adult who had contracted anthrax (malignant pustule) on the right upper arm from going into hide godowns in Calcutta with his shirt sleeves rolled up during the hot weather. When first seen, the patient showed intense swelling of the arm and shoulder, with a temperature of 105°F. and a pulse rate of 128 p.m. Smears showed the presence of anthrax bacilli. The pustule was excised and carbolic fomentations applied. An immediate dose of 40 c.c. of Selavo's anti-serum was given, followed by another 70 c.c. distributed over the next three days. In all 150 c.c. were given. The temperature gradually fell to normal. Then there was a re-appearance of a black slough at the upper edge of the wound; which was now dressed with gauze soaked in Selavo's serum, the edges being vaselined. A line of demarcation followed, and the slough separated. The lesion was next dressed with electrolytic chlorine, 1 : 5; later with gauze soaked in Benger's Liquor Pancreaticus. The ulcer left was now perfectly clean, about 2½ by 1½ inches, down to the deep fascia, and healthy; it was being dressed with electrolytic chlorine. The surgeon's intention was to heal it by the final application of a skin graft.

In commenting on the case, Lieut.-Col. V. B. Green-Armstrong, I.M.S., remarked that he had seen several similar cases among artillery men and cavalry during the war in France. These were not invalided to the base. They were treated by local applications of pulv. ipecac. and cleared up remarkably rapidly. How the drug acted, he could not say. Dr. G. Panja stated that only one case of malignant pustule had been seen in six years' observation of skin cases in the skin outpatient clinic at the Calcutta School of Tropical Medicine. He enquired whether a culture had been taken from the healing wound. Formalin kills anthrax spores very rapidly, and he suggested dressings with formalinised-glycerine.

Case 2.—This was a Goanese male child of 13 years of age with a lesion of the spinal cord. When first seen he had suffered for eight months from pain in the

back, spreading gradually to the legs, so that he could not walk. The knee jerk was lost on the left side, there was flaccid paralysis of both legs with wasting, incontinence of urine, and difficulty in defecation. A skiagram showed a mass occupying the site of the spine of the 4th lumbar vertebra, calcified in places, and encroaching on the spinal canal. There was marked mottling in the space between the 4th and 5th lumbar vertebra; the Wassermann reaction was doubtful and the Kahn test negative. Tuberculosis could be excluded. The diagnosis was a neoplasm (? sarcoma).

Treatment was by deep X-ray therapy, exposures daily for twelve days to each of two lateral and one posterior fields in turn. Skiagrams after treatment showed the details of the bones and soft tissues much improved. Pain was absent; the patient can walk with assistance; and control has been regained over the bladder and rectum. The intervertebral disc between the 4th and 5th lumbar vertebra shows ossification. The spinal canal is now free of deposit. It seems probable that the tumour is a periosteal sarcoma, owing to the ossification of the intervertebral disc.

Lieut.-Col. E. O'G. Kirwan, F.R.C.S.I., D.O.M.S., I.M.S., then showed a series of cases of ophthalmological interest. These were as follows:—

Case 1.—An Indian girl of 22 years of age suffering from dystichiasis, with a row of accessory cilia on all four eyelids. The accessory cilia were shorter and finer than the normal eyelashes. Such cases are extremely rare; a recent authority mentioning only 6 collected cases in 20 years' of the literature. The condition causes watering and redness of the eyes. It represents a reversion to ancestral conditions, is usually congenital, and usually involves all four lids. The left eye had been operated on, electrolysis being used in addition.

Cases 2, 3, 4.—Tattooing of leucomata of the cornea. A 2 per cent. solution of platinum perchloride had been used, and the cosmetic results were excellent. It was necessary to remove the epithelium first. The results were far better than those by the old method with Indian ink. Dr. G. Panja enquired whether the same process could be applied to cases of leucoderma, and Col. Kirwan pointed out in reply that denudation of the epithelium was a necessary preliminary.

Cases 5, 6.—These were cases of ingrowing eyelashes, treated by Webster's operation. This involves removing the ingrowing eyelash with attached mucous membrane, and all underlying fatty tissue, and grafting with a graft taken from the mucous membrane of the mouth. The results were excellent. This condition was often a result of trachoma in India.

Cases 7, 8.—Cases of interstitial keratitis due to hereditary syphilis, one a male child, the other a male adult, but both of congenital origin. In the child one eye was completely blind, but the other was clearing up under treatment, and vision was now 6/12ths. The Wassermann reaction was negative. Prognosis in adults was not nearly as good as in children. He wondered whether experimentally induced malaria might affect the condition beneficially? In the adult case the Wassermann reaction was positive.

Such cases were of importance from a medico-legal point of view, for the slightest trauma might precipitate the onset of the disease. The condition was one of the contributory causes of blindness in Bengal.

Cases 9, 10.—These were cases of keratomalacia in an adult and a child respectively. The pigmentation and degeneration of the corneal surface were demonstrated. This disease was quite the commonest cause of preventable blindness in Bengal. Coolies and *paharis* (coming from hill stations) were especially affected; Bengalis less so. The child had completely lost vision in the right eye, whilst in the left eye there was a deep ulcer of the cornea with prolapse of the iris. In the case of such ulcers what usually happened was secondary infection with pneumococci or streptococci.

Treatment of the disease was simplicity itself: one put the patient on to cod-liver oil, fresh vegetables, and calcium salts. The condition was one essentially due to vitamin deficiency. Textbooks asserted that



the disease was rare in adults, but, in his experience, it was extremely common in adults in Bengal.

**Case 11.**—A male adult showing epitheliomata of the eyelids of both eyes. A microscopical section of tissue removed confirmed the diagnosis.

**Case 12.**—A very unique case of epithelioma of the conjunctiva, close to the margin of the pupil. The patient is a permanent way inspector on the railway, and much exposed to glare and dust. The growth recurred after a first operation for its removal. A microscope section confirmed the diagnosis. Sight is still normal in the affected eye, and radium treatment was suggested.

In the discussion on Col. Kirwan's cases, Col. Green-Armytage asked whether Col. Kirwan had tried "veterinary" cod-liver oil in keratomalacia; this product is not purified, it is some six times as potent in vitamine content as refined cod-liver oil, is very much cheaper, and is now in use in several London hospitals, including the Hospital for Sick Children in Great Ormond Street. In reply, Col. Kirwan stated that the treatment of keratomalacia was very easy in children, who responded rapidly to it, but much more difficult in adults.

## Current Topics.

### Notes on the Treatment of Gonorrhœa in the Male.

By H. D. LIVINGSTONE SPENCE, M.D.

*The Lancet*, 4th January, 1930, p. 19.

GORRHOEA restricted to the anterior urethra is a trivial complaint. Its importance rapidly increases as infection spreads and the posterior urethra and contiguous parts are successively involved.

Our first care is to support the patient's immunological defences by regulating personal habits and activities, and by rendering the urine at once less irritating and less favourable to the multiplication of gonococci by dilution and alkalinisation. Local measures will aim at destroying germs and controlling inflammation without injury to the urethral lining.

It is questionable if the dietary restrictions commonly imposed are of much practical value. The withdrawal of meat, tea, coffee, ordinary condiments—and tobacco—is sufficiently a deprivation to cancel any theoretical gain, and excellent advice about rest and the speculative advantages of a milk diet chiefly adds to the characteristic mental depression of the patient. Competitive games, dancing, and riding should be given up, sexual excitement is to be avoided, and alcoholic beverages, ginger ale, ginger beer, and cider are definitely harmful.

The ideal antiseptic for use in the inflamed urethra would be clean, non-irritating, penetrative, stable in aqueous solution, and effective alike against the gonococcus and any secondary organisms without being toxic to the host. At present no single preparation fulfils these requirements. Potassium permanganate is a feeble germicide, colours the skin and clothing, and seems to encourage intra-urethral and para-urethral complications, its principal effect being to provoke a rapid and intense œdema undesirable in the early inflammatory stage. Mercurochrome is an exceedingly interesting experiment, mercury being linked to a dye in an effort to produce a deeply penetrating antiseptic. It penetrates well but stains everything it meets an almost indelible red, is distinctly irritating, and, as a urethral antiseptic, disappointing. Acriflavine also stains, and is subtly irritating, but is otherwise a quite useful all-round germicide, penetrative to a degree, unaffected by urine, and to be recommended for occasional rather than routine use. In a mixed infection it is my practice to employ separate agents for the gonococcus and saprophytes, used together if chemically compatible, *seriatim* if otherwise, the gonocide being frequently changed to avoid

"fastness." Mercury oxycyanide, for example, is quite good against the staphylococcus and other followers, but an indifferent gonocide, while the innumerable silver colloids provide many reasonably effective gonocides, often not too clean, but bland and non-irritant when freshly prepared, and eminently suitable for use in the inflamed urethra. Among the milder silver preparations, indicated in the early stage as gonocides, the writer favours argyrol, neoreargon, neoprotosil, cargentos, and collosol argentum, to be succeeded by albargin, hegemon, novargon, protargol, acriflavine hydrochloride, thallin sulphate, or silver nitrate later on as symptoms decline, and a little stimulation seems desirable.

#### Use and Abuse of Irrigation.

When anterior gonococcal urethritis terminates favourably damaged epithelium is shed, tension in the tissues diminishes, gonococci vanish, the meatal discharge lessens and stops, pus cells are no longer recoverable from the urine, and the urethral mucous membrane resumes its normal appearance. This is clinical cure and in established infections should be complete in three or four weeks. The failure of symptoms entirely to disappear may be due to over-treatment, the first urine containing light tissue detritus and perhaps just sufficient muco-purulence to render it slightly hazy. The presence of heavier flakes and many pus cells, and, particularly, the discovery of gonococci, indicate the persistence of infection deep in the tissues, in Littre's glands, the lacunæ of Morgagni or adventitious passages, or that infection has reached the posterior urethra. The latter development may be heralded by terminal hæmaturia, signifying an acute onset, and since much more serious events are now in prospect, correct treatment at this point is of obvious importance. The one can do is to attempt to irrigate the bladder from the meatus, infection of the seminal vesicles and prostate being in such case almost inevitable and extension to the epididymes likely. A better plan is to insert per rectum a suppository containing morphine sulphate (gr.  $\frac{1}{2}$ ) and atropine sulphate (gr.  $\frac{1}{75}$ ), to be repeated in four hours, add tincture of hyoscyamus to the alkaline mixture, and omit all local treatment for 48 hours. At the end of this period the anterior urethra should be washed first with half-saturated acid boric solution and then with collosol argentum, after which a sterile No. 8-E. soft rubber catheter is introduced beyond the cut-off muscle and an ounce or more of collosol argentum allowed to trickle slowly into the posterior urethra and bladder, to be retained. This procedure is repeated in 24 hours, and thereafter 1 per cent. protargol may be substituted for a day or two, or retrograde lavage at once commenced with silver nitrate, 1–5000, containing 1 per cent. acid boric. More often posterior urethritis begins insidiously and pursues from the first an essentially chronic course.

While infection is restricted to the anterior urethra, local treatment is performed, using a small all-glass acorn-tipped bulb or piston syringe. With the extension of inflammation beyond the bulbous portion to the membranous and prostatic urethra antiseptic must be carried past the cut-off muscles, and the method of their introduction is of some importance. With the Janet method of irrigation from the meatus there is the danger of injuring the inflamed mucous membrane through over-distension, and Kohnstam and Cave have shown how easily fluid is driven into the seminal vesicles during forced irrigation of the bladder. For these and other reasons the retrograde method of lavage is preferable, the fluid being introduced into the bladder through a catheter or tunnelled sound and then voided naturally, when the tendency, if any, is to remove material by aspiration and contractile pressure from soiled glandular ducts.

The secretions of the seminal vesicles and (usually) the prostate are alkaline in reaction, a circumstance which might be expected to confer a certain protection against gonococcal penetration, but unfortunately does not do so. Inflammation may remain confined

to the prostatic and ejaculatory ducts and, being catarrhal only, give little evidence of its existence. Where it is progressive the ducts become more or less occluded, drainage is impeded, the glands enlarge and become diseased. Owing to their vascularity, implication of the seminal vesicles is a threatening development, as toxic absorption is increased, and gonococci may eventually reach the general circulation; more commonly, however, there is extension along the ductus deferens to the epididymus. The advance of infection along the prostatic ducts leads to parenchymatous or interstitial prostatitis, the latter form proceeding to abscess formation.

Complications like epididymitis and hyperacute febrile inflammation of the prostate gland or seminal vesicles require the temporary cessation of treatment per urethram in favour of chemotherapy or vaccination, either of which is superior both in immediate and ultimate effects to operative or other methods in the writer's experience. The use of metals in this connection is admittedly empiric, although there is an experimental basis for the belief that certain inorganic substances upon reaching the blood stream act like living or dead bacteria in inducing the leucocytes to liberate a non-specific bactericidal or bacteriostatic element. In practice it is often surprising how rapidly and completely acute epididymitis subsides after two or three intravenous injections of sulfarsenobenzene, and hyperacute inflammation of the other glands accompanied by temperature is almost equally well controlled by chemotherapy without, however, any marked effect being produced upon the general course of the disease.

#### *Massage and the Passage of Sounds.*

In health the seminal vesicles are difficult to distinguish per rectum, but they are readily palpated in disease, and there is a variable amount of conservative inflammation in the periglandular tissues. Depending upon the period and character of the infection, one or both lobes of the prostate may be enlarged, smooth and tense or, instead, feel nodular, suggesting a collection of lobulated masses. From the standpoint of remedial treatment, however, it is expedient to regard the inflammation of both prostate and vesicles as secondary, the primary lesions being in their ducts and the restoration of their calibre a necessary prelude to cure.

One or two quite light strokes are sufficient to empty a seminal vesicle whose duct is patent, and massage of the prostate gland should be of the gentlest description, a series of joined copy-book O's centripetally stressed from above downwards, and never the "firm downward pressure" of the older text-books. Massage at all violent readily injures these friable glandular tissues, and is more likely to retard than assist recovery. Nor is it necessary or desirable to attempt mechanically to empty either prostate or vesicles at each session if the trouble is, for practical purposes, obstructive.

There are experienced specialists who seem to counsel the abandonment of massage altogether, but it is a little difficult to accept this view. Light rectal massage seems needed to maintain tone and contractile power, combat stasis, and assist in the removal of cellular deposit, but the first consideration is to secure resolution of the inflammatory exudation in the urethral region so that adequate drainage may be re-established.

The passage of cold steel sounds, if properly timed, is a valuable aid in accelerating resolution and more effective than the use of dilators. It is often thought that the benefit accruing from instrumentation is wholly to be attributed to the mechanical stretching of the urethral canal, hidden foci being uncovered, crypts and folds ironed out, the lacunæ and Littre's glands pressed free of their contents. This explanation, however, is incomplete, for these are only incidental and relatively superficial effects of the passage of steels, more important being the influence upon plastic exudation, the resorption of which is actively promoted. In chronic anterior urethritis the parts become semi-indurated, and if inflammation

persists connective tissue cells will gradually replace small cells in the subepithelial area converting "soft" into "hard infiltration," found in organic stricture. The last, however, is a terminal condition and comparatively remote, and at an earlier stage infection and increasing tension disturb glandular function, the mucous membrane is irregularly swollen and dull, its folds are less distinct, and there is a patchy loss of surface epithelium, while layers of new cells are laid down beneath as a result of continued irritation. Analogous changes occur in the infected posterior urethra; the verumontanum is engorged and soft and the prostatic and ejaculatory ducts ringed with inflammation and more or less occluded. It is true that a steel may, and does expose an infective focus here and there as it traverses the urethra, but its real importance is the circumstance that it meets the first therapeutic indication in chronicity—namely, stimulation. After a preliminary blanching the urethral lining becomes congested, leading to a lively flare-up of the previously sluggish infective process. These symptoms decline after a few days' retrograde lavage, and with the ebb-tide some recession of the underlying inflammatory condition takes place. The next steel awakens less reaction, a third still less, until finally upon total resolution meatal discharge ceases, the urine clears, and the patient is pronounced clinically well.

The post-gonorrhœal "morning drop," whatever its bacterial content, is always suspect. It has led abruptly to the divorce court; a longer and well-worn path ends at the gynaecologist's. Treatment of the male gonorrhœic should be continued until subjective and objective signs of the disease have completely disappeared, the five-hour urine is perfectly clear, and white cells are no longer recoverable in significant numbers from the genito-urinary tract. After two months the complement-fixation test should be declining in strength or negative, and if the patient also registers a gain in weight his future may be regarded with confidence.

### **Is Tuberculin Worth While?**

By LIEUT.-COL. F. E. GUNTER, D.S.O., M.D. (Edin.),  
R.A.M.C. (retired).

(Abstracted from *The Medical Press*, 13th November, 1929, p. 289.)

THE physician who uses tuberculin at all extensively, acquires the "tuberculin habit," and he is apt to become a little intolerant with others who do not see eye to eye with him as to its value. We must remember, however, that the use of tuberculin as a remedy has been condemned, and when once a therapeutic measure has become "taboo," it is difficult to get a patient rehearsing of arguments in its favour. Thoroughly appreciating this fact, I am limiting my remarks, as much as possible, to my own personal experience with tuberculin during the past six years at Margaret Street Hospital.

#### *Tuberculin in Diagnosis.*

It is now generally accepted that tuberculosis is not inherited. It is contracted, for the most part, in early childhood. Once the bacillus gains entrance into the human body it remains comparatively latent and harmless, in the majority of cases, throughout life. At the same time it may be sufficiently active to give a reaction with undiluted tuberculin. For this reason, when once a person has given a positive von Pirquet, which implies that infection has occurred, he will frequently react to that test till the end of his days. The fault of the test is that it is too delicate, and so is of little value as an indication of active tuberculosis.

The same argument does not apply to tests with diluted tuberculin, such as the subcutaneous method of Koch, the intradermal test, and the modified von Pirquet, introduced into England by Dr. H. A. Ellis.

All my cases were tested by the multiple cutaneous method. The procedure is as follows:—

One drop of normal salt solution is placed on the forearm. This is the control. Conveniently near are placed drops of 1 in 500, 1 in 100, and 1 in 10 dilutions of tuberculin. A few short incisions are made through the drops, sufficiently deep to draw blood. In three days' time the scars are examined for signs of reaction. This is shown by redness, perhaps swelling, in the various scarified areas. If there be no changes, even in the lowest dilution, the patient is said to be "tuberculin negative," and is, to all intents and purposes, not tubercular. A reaction with 1 in 10 only denotes more or less inactivity, 1 in 100 activity, and 1 in 500 great activity. The test appears to be trustworthy, and has a distinct place in diagnosis, but, of course, should not be relied upon by itself. To brand an apparently healthy person as tubercular because he reacts to 1 in 10 tuberculin, and to treat that person with tuberculin, would be as absurd as to call a healthy person anemic because the hæmoglobin content of the blood is a little below normal, and to treat him with a course of iron. In making a diagnosis of active tuberculosis, and by active I mean a tubercular condition which is causing ill health, we should consider the following factors: (1) the family history; (2) the personal history and symptoms; (3) the blood pressure; (4) physical signs; (5) the skiagraphic findings; (6) the reaction to tuberculin; (7) the presence of tubercle bacilli in the sputum.

I will take up some of these points in detail:—

**Family History.**—Although insurance companies realize that tuberculosis is not inherited, they lay great stress on a history of consumption in the family, as this suggests the greater likelihood of the candidate having been infected than in the case of those in which the family history was a good one. They are particularly chary of light weights with a bad family history. I find that 18 out of 100 of my cases who gave definite tuberculin reactions had a history of some member of the family having died of consumption. Calmette states that 50 per cent. of children brought up in tubercular families contract tuberculosis, and of these 40 per cent. die of acute tuberculosis. If, however, they be removed from their homes before they react to tuberculin, not 1 per cent. die of acute tuberculosis.

The chief points about the symptoms in the cases under review are that they are rather indefinite, and, above all, of long standing. Amongst them are gradual loss of weight, loss of energy, dyspepsia, night sweats, vague symptoms of neurasthenia, coughs, constant colds, and asthma. A few gave a definite history of pleurisy, and one or two reported that at various times they had had blood in the sputum. Any such symptoms should make one consider the possibility of active tuberculosis.

**Blood Pressure.**—A low systolic blood pressure is always suspicious, but a high one does not exclude tuberculosis.

**Physical Signs.**—These are, of course, all important if positive, but our aim should be to diagnose active tuberculosis before definite changes in the lungs can be detected by physical signs.

**X-ray reports** are of great value when made by an expert. Out of 100 of my cases (including 12 T. B. positive), 57 gave skiagraphic evidence of definite lung changes (33 of these showed x-ray signs of activity).

**The Modified von Pirquet Test.**—By means of x-rays, physical signs, and the examination of the sputum, we can make a fairly accurate diagnosis as to whether the lungs are affected. But what of the 40 to 50 per cent. of possibly actively tubercular who have no evidence of lung lesions? It is in these cases that the modified tuberculin test is so valuable, especially in asthma, as will be shown later. Without the use of tuberculin in these cases you are simply guessing at the cause of ill-health. In addition to diagnosis, the test is of value as a guide to treatment.

I have constantly noticed that the more sensitive the skin be to tuberculin, the better the result in treatment; but sensitiveness is an indication for caution, and it is wisest therefore to begin treatment via the skin rather than subcutaneously in highly sensitive cases.

#### *Tuberculin in Treatment.*

Turning now to the place of tuberculin in treatment, I have before me notes of 100 cases treated with tuberculin. The number is not large, but perhaps it will suffice to illustrate certain principles.

My list includes 44 cases of asthma, 40 tubercle bacilli negatives, 12 tubercle bacilli positives, and 4 cases of glandular tuberculosis. Of the cases of asthma (44), seven had a family history of consumption, and nine of asthma, that is to say, in over one-third of the cases there appeared to be some hereditary connection. The duration of the asthma was from 1 to 24 years. Sixteen of them had definite lung lesions, as shown by x-rays; the remaining 28 showed no changes in the lungs.

**Reaction to Tuberculin.**—Thirteen reacted to dilutions of 1 in 10, but not to higher dilutions; 26 reacted to dilutions of 1 in 100, but not to higher dilutions; 5 reacted to dilutions of 1 in 500.

**Treatment.**—A few were treated by tuberculin liniment alone, but, in the majority of cases, this was followed by a course of tuberculin injections up to fairly large doses.

**Results.**—Asthma with definite changes in lungs as shown by x-ray (16 cases): 9 are apparently well; 7 improved considerably. Average gain in weight 4½ lb.

**Asthma with no lung changes** (28 cases): 22 well; 4 improved; 2 no improvement. Average gain in weight 11 lb. It would appear, then, that for asthmatics who definitely react to tuberculin we have in this agent a most valuable remedy.

**T. B. negative cases with definite x-ray evidence of changes in the lungs** (25 cases). Symptoms which made one suspect the possibility of tuberculosis were: loss of weight, 9; constant colds, 6; hæmoptysis, 5; night sweats, 3; chronic cough, 2. In six of the cases there was a family history of consumption.

**Physical Signs.**—Four showed definite signs of long-standing phthisis, apparently stabilised, but with these exceptions, physical signs were not very definite. X-ray findings: old cavity apex, 1; hilum tuberculosis, 11. More or less generalized fibrosis, 13.

**Tuberculin Reactions.**—Four reacted to 1 in 10; 16 reacted to 1 in 100; 5 reacted to 1 in 500. Treatment was mostly by liniment, followed by injections.

**Result.**—Every single case improved; I hesitate to say "cured" in cases in which there was definite x-ray evidence of lung changes. It is interesting to note, however, that of six cases which were x-rayed at the end of the course, as well as at the beginning, three were reported to be then normal, and three had improved from an x-ray point of view. In the twenty-five cases there was an average gain in weight of 10 lb.

**T. B. negative cases with no x-ray evidence of changes in the lungs** (15 cases).—In three cases there was a family history of phthisis. Symptoms: loss of weight, 5; chronic cough, 3; history of pleurisy, 2; rheumatism, 1; night sweats, 1; bronchitis, 1; chronic colds, 1; neurasthenia, 1. Two reacted to 1 in 10; nine reacted to 1 in 100; four reacted to 1 in 500. Treatment: mostly by a short course of liniment only, but in some cases by injections in addition. Result: every case apparently well at end of course. There was an average gain in weight at end of treatment of 8 lb. That these patients could have been restored to health by other means I am not denying, but I am convinced that in tuberculin we have the best and simplest way of attaining this result.

**Glandular Tuberculosis.**—I have not much experience of this class of case, but I have notes of three. They all reacted strongly to tuberculin. They all greatly improved in health, and had an average gain in weight of 16 lb. Treatment was commenced

in each case by skin medication as they were all markedly sensitive to tuberculin.

**T. B. positive cases.**—With regards T. B. positive cases, I have a different tale to tell. I have had twelve such cases under treatment at various times. Four only could be said to be greatly improved. A fifth somewhat improved, but did better under light treatment. The remaining seven have all died. These were advanced cases of phthisis, and two of them had ulceration of the larynx. Tuberculin apparently did them no harm, but I cannot say it did them much good. I am not writing to discourage the use of tuberculin in open tuberculosis of the lung. My object, however, in writing this paper is not to vaunt tuberculin as a panacea for all cases of tuberculosis, but to emphasise its value and limitations as deduced from my own personal experience.

#### Conclusions.

(1) In diagnosis the modified cutaneous test has an important place. It is specially useful as indicating sensitiveness to tuberculin.

(2) **Asthma.**—If a case of asthma reacts to tuberculin, even if there be no x-ray evidence of abnormality in the lungs, that asthma should be treated with tuberculin. You should expect a cure or great improvement in nearly all cases. Failures are the exception.

(3) In T. B. negative cases with definite x-ray evidence of changes in the lungs, you should expect to get very marked improvement in health, possibly a cure. Such patients should be kept under observation after treatment, say, at six months interval, and if they show a recrudescence of symptoms they should have another course of tuberculin.

(4) If the sputum be negative, and if there be no x-ray changes, but if the symptoms point to a possibility of tuberculosis, and the multiple cutaneous test is at all marked, it is well worth while to give a short course of tuberculin liniment, followed, if necessary, by injections. You should look for a quick return to absolute health in every case.

(5) If we wait till tubercle bacilli have appeared in the sputum before treating with tuberculin, we have waited too long, and the results are apt to be disappointing.

#### Observations on Vaccination.

By S. P. BEDSON, M.D., M.Sc. (Durh.).

(*The Lancet*, Vol. CCXVII, 2nd November, 1929, p. 920.)

ALTHOUGH the method of prophylactic immunization against smallpox has undergone no fundamental change since Jenner's time, certain modifications and improvements have been made in it. Arm-to-arm vaccination has been abandoned for obvious reasons. Vaccine lymph is now produced in large quantities and under carefully controlled conditions. The calf is the animal most generally employed for this purpose, but since the virus of cow-pox tends to behave irregularly after prolonged passage in this animal, passage through other animals, such as the rabbit, has become necessary from time to time to rejuvenate the virus. Again, when fresh seed lymphs are required one now has recourse to cases of smallpox. The virus of smallpox, when established either directly in calves or after preliminary passage through monkeys or rabbits, acquires the characters of cow-pox; in fact, the two viruses are immunologically identical, and differ only in their species adaptation.

The Jennerian method of vaccination has always had its opponents. These have steadily increased in number, and it is claimed by the anti-vaccinators that this method of preventive inoculation is attended not infrequently by untoward consequences. These claims have been very largely discounted by the medical profession, and rightly so. Opposition has come almost entirely from those ill-qualified to pronounce on the matter, and it has been felt that the claims

were the outcome of too free a use of that faulty line of reasoning, *post hoc ergo propter hoc*.

#### Encephalitis.

Of late years, however, a complication of vaccination has made its appearance which, though of rare occurrence, is disquieting because of its high rate of mortality. I refer, of course, to post-vaccinal encephalitis. The onset is abrupt, some 9 to 12 days after vaccination, with headache, vomiting, and drowsiness. The patient usually passes into coma, and the other signs present vary with the portion of the central nervous system involved. About half the cases end fatally; those that recover do so completely without residual symptoms. This form of encephalomyelitis closely resembles those cases which occur rarely in the course of acute infectious diseases, such as measles, smallpox, chickenpox, and mumps, and this resemblance extends to the essential histological lesion which has been shown to be a perivascular demyelination.

Post-vaccinal encephalitis was first recognized in 1912, when a case occurred at the London Hospital. It reappeared in 1922 when, again at the London Hospital, four cases were recognized and submitted to a detailed investigation. Between 1922 and 1927, 93 cases have occurred in this country, representing an incidence of 1 in 48,823 persons vaccinated; 62, or 66.6 per cent., of these cases occurred in patients between the ages of 5 and 14 years. Apparently the unvaccinated infant and persons submitting to re-vaccination are not susceptible. This statement requires some slight qualification since Turnbull has described one case in an infant under three months. However, this appears to be the only case of the kind on record, and one may therefore conclude that the susceptible individual is the one submitting to primary vaccination at any age after infancy, but more particularly between the ages of 5 and 14 years. In this connection the figures for post-vaccinal encephalitis in Holland are of interest. In that country primary vaccination has been very largely practised at school age, and for the period 1922-27, 123 cases occurred out of 495,431 vaccinated, or 1 in 4,028. This gives us a clearer conception of the risk attendant on primary vaccination in those other than infants.

The ætiology of post-vaccinal encephalitis remains obscure. There are three hypotheses current. The condition may be due to the vaccinia virus; infection with the vaccinia virus may light up a dormant neurotropic virus which the patient was harbouring; or, as has been most recently claimed, the condition may be a toxic one. The last conception seems to me difficult to accept. Occasional cases of post-vaccinal encephalomyelitis have taken the form of a transverse myelitis without other involvement of the central nervous system, and these cases are not readily explained on a toxic basis. The probability is, therefore, that we are dealing with a condition produced either directly by the vaccinia virus or indirectly through the activation of an unknown latent virus by the vaccinia virus. Whichever of the two views may be correct, it appears to me necessary for the vaccinia virus to invade the body generally, and the central nervous system in particular, for post-vaccinal encephalitis to occur.

#### The Practitioner and Vaccination.

The question of practical importance is: What is to be the attitude of the medical practitioner towards vaccination? There are those whose reply is: Continue vaccinating as before. It is inconceivable to my mind that any one should adopt such an attitude. Were we dealing with protection against the risk of virulent smallpox there might be some excuse for this attitude. Even so, it would be a confession of ineptitude on our part. But the type of smallpox in this country at the present time is extremely mild and rarely fatal, so that to continue vaccinating as before would be to ask the individual to submit to a prophylactic measure whose risk of death equalled

that of the disease against which he was being protected.

Obviously something must be done.

#### *Diluted Lymph.*

It is clear from animal experiments with vaccinia virus that the degree of invasion varies directly with the dose inoculated. It occurred to me therefore that the risk of encephalitis should be lessened if a smaller inoculum were used, and during the last three years diluted calf lymph has been in use at the London Hospital, though only in the last six months has it been used at all excessively. The dilutions have varied from 10- to 50-fold, the diluent employed being an M/50 phosphate solution, pH 7.6, though saline or sterile water could be used. The diluted lymph is used within 24, or at most 48 hours, after dilution, and it has been the practice to vaccinate in two places, using a crucial incision of 3/8 inch diameter. The Vaccination Committee of the Ministry of Health obviously had the same idea, for they recommended one insertion of the undiluted lymph by means of a 1/4 inch linear incision in place of the usual cross hatching.

It is not claimed that the use of diluted lymph is the solution of the problem with which we are faced. It is, however, reasonable to suppose that it considerably reduces the risk of post-vaccinal encephalitis. It certainly gives much more satisfactory tasks, and out of some 700 patients so vaccinated no excessive reactions have been observed. The number of primary vaccinations at a susceptible age has been very small, so that, of course, it is impossible to draw any conclusions as to efficacy of this method as a means of avoiding post-vaccinal encephalitis. However, no such cases have occurred. The ideal to be aimed at is a perfectly safe method of immunization against smallpox, and it is our hope that such a method will be evolved. It has been shown that if the virus of foot-and-mouth disease is inactivated by means of formalin in low concentration it still retains its antigenic properties, and this method has been employed in the preparation of vaccines for distemper and yellow fever. Work is in progress here to find out whether some such method could not be applied to the vaccinia virus. In the meantime, however, I would make the following suggestions: (1) When vaccinating infants, or performing revaccination, use lymph diluted 1 in 10, making one or two insertions with a crucial incision (*no cross hatching*), or vaccinate as the Ministry of Health have recommended, making one insertion with a single linear incision, using undiluted lymph. (2) When called upon to perform primary vaccination in any person other than an infant, find out first of all if it is absolutely necessary to vaccinate. The only condition rendering vaccination necessary in such a case would be the risk of exposure to *virulent* smallpox. If you *have* to vaccinate a susceptible individual, then do so with lymph diluted 1 in 50, making one insertion with crucial incision.

### **Remarks on the Pathogenesis and Treatment of Asthma.**

By ARTHUR F. HURST, M.D., F.R.C.P.

(Abstracted from *British Med. Journ.*, 9th November, 1929, No. 3592, p. 839.)

IN discussing the treatment of asthma we have to consider the underlying constitutional abnormality, the chemical, reflex, and psychological factors which can initiate an attack, the attack itself, and the secondary changes in the lungs which result from repeated attacks. It is clear that the only true cure of asthma would be to abolish the diathesis by bringing the biochemical constitution of the body fluids to the normal level. Removal of exciting factors leads to diminution of the frequency of attacks, and complete success in this direction may lead to an apparent cure. But the condition is not really cured, as the diathesis remains,

and at any time the individual may become sensitized to another protein as, for example, after an attack of influenza or other infection involving the nose, throat, or bronchi—or a new peripheral source of irritation which leads reflexly to attacks may arise, or some psychological disturbance may develop which results in a relapse. Moreover, the effects of desensitization are only temporary, and avoidance of exciting causes, such as feathers, oats, or pollens, even for long periods, does not diminish the tendency to asthma on re-exposure. I used to say that the only cure of asthma was not to have it, by which I meant that one might hope that the bronchial nervous system might cease to be abnormally irritable as a result of disuse if it were never called into activity. But this is unfortunately not always true, at any rate in adults, as I have now seen numerous patients who have relapsed after thinking themselves cured for periods varying between one and twenty-five years. Lastly, treatment of the paroxysm is of the greatest importance, as, if successful, it may make it possible for a man to continue in full activity instead of becoming a hopeless invalid.

Among the innumerable forms of treatment which have been advocated two appear to attack the diathesis; these alone, if successful, might be regarded as genuine "cures." The first is by means of diet, a treatment which has been very successfully applied, especially in children, by Dr. Adam and Dr. Cameron. The second is by residence at a height between about 4,000 and 6,000 feet. Asthma is almost unknown among the natives of the Engadine, Davos, Villars, and similar centres in Switzerland, and at least 90 per cent. of asthmatics lose all, or nearly all, their symptoms within a very short period of their arrival in these places. Unfortunately, the effect is only temporary if the stay is a short one, the asthma returning, often within a few hours, on reaching the plains. But residence for one year, or preferably several years, in the Alps almost invariably leads to a permanent cure in children, in spite of complete failure of every known form of treatment at home. Storm van Leeuwen attributed the effect of the Alps to freedom from dust. I am convinced that this is erroneous, as there is no obvious difference between the hotels at a height of 4,000 feet and those 2,000 feet lower, and yet a man who is severely asthmatic in the latter is often quite well and can take vigorous exercise within twenty-four hours of moving to the former. Moreover, no house could be fuller of "allergens" of every kind than the hermetically sealed chalets of the Alpine peasants during the winter, although asthma is unknown among them. It is also a common experience among asthmatics that conditions which invariably lead to asthma when they are at home are innocuous in the mountains; it seems, in fact, that nothing could produce an attack when the 4,000 feet level has been reached. It is clear that the effect is due to altitude, a conclusion which has been confirmed by the experience of the asthmatic members of the Air Force, who find that they can always find relief by flying sufficiently high. It is unknown why altitude should have this remarkable effect, but I expect it will be found that the lowered oxygen tension leads to biochemical changes in the blood, which result in diminution in the irritability of the bronchial nervous system. The further lowering of oxygen tension when a still greater height is reached has the reverse effect though each individual appears to have an optimum level. This accounts for the reappearance of attacks on reaching greater heights in the Alps and the frequency of asthma in such places as Johannesburg.

It is, I think, possible to look forward to the time when sufficient is known about the biochemical changes which constitute the asthmatic diathesis to make it possible to imitate the effect of high altitudes by well-defined changes in the diet, aided, perhaps, by drugs which can correct deviations from the normal reaction of the body fluids and make good any deficiencies in their mineral or other constituents. I should mention here the success obtained by Dr. Oriel,



especially in children, by adding glucose to the diet, together in most cases with the regular administration of alkalies.

Some of the many chemical stimulants of the irritable bronchial centre can be avoided by a change in habits, diet, or environment. Others can sometimes be rendered innocuous by desensitization.

With regard to reflex exciting causes, it is necessary to emphasize the importance of avoiding distension of the stomach and the rectum. In the case of the nose there are three distinct factors which require attention. The first and most common is chronic infection of the sinuses, especially the ethmoids, with secondary development of polypi; this must be dealt with by the cure of the infection, which can generally be effected by vaccination and packing with silver preparations without more radical operations than the removal of polypi. The second factor is obstruction of the nasal passages; it is essential to overcome this, as few asthmatics can be permanently relieved if they remain mouth-breathers. Lastly, the asthmogenic area on the nasal septum should be either destroyed by cauterization or rendered inoperative by so correcting the other factors present that the turbinates no longer come into contact with it, even when distension of their cavernous tissue occurs as a result of gravity on going to bed. Chronic bronchitis, which also acts both as a reflex cause and as a focus of infection with organisms to the toxins of which the individual is sensitized, should be treated by autogenous vaccination, small doses of iodide, and climate.

The psychological factor requires consideration in the treatment of every case of asthma. At least 75 per cent. of patients become either completely free or almost free from symptoms directly they enter a hospital or clinic. This is doubtless often in part due to the fact that they have got away from the allergens present in their homes, which were responsible for some of their attacks; it is often partly and sometimes entirely due to the expectation that they are going to derive benefit from the treatment they are about to receive. It is essential to bear this in mind in estimating the effect of any treatment. If, for example, they are at once put into a dust-free chamber or are given some new drug, it is natural that they will ascribe the inevitable improvement to the specific treatment, whereas in all probability an equal degree of improvement would have occurred without any active treatment at all. It is always wise to instil a spirit of optimism into asthmatics, and to make them realize that improvement may at any time occur and that conditions which formerly gave rise to asthma may cease to do so. In this way alone can the influence of expectation in the production of attacks be overcome. A wise physician will also rarely fail to find some way in which unobtrusive psychotherapy benefits his patient.

In the treatment of the asthmatic paroxysm the preponderating activity of the vagal nerve supply to the bronchi can be overcome by means of drugs, such as atropine, which paralyse the vagus, or by adrenaline, which stimulates the broncho-dilator fibres of the sympathetic. The inhalation of fumes from powders containing stramonium or belladonna, which was formerly the universal method of treatment, had the grave disadvantage of causing chronic bronchitis by irritating the bronchial mucous membrane. This treatment should now never be used, as the opposite method of restoring the balance by means of adrenaline has no such disadvantage and is also more promptly and more constantly effective. The patient should be taught to inject the adrenaline himself, as if he does this at the first sign that an attack is developing it will be aborted, and a single minim will often be sufficient, though five or more would have been required if he had had to wait for a doctor or a nurse to give the injection at the height of the attack. This small dose gives rise to none of the unpleasant symptoms often caused by larger doses, and as it does not even raise the blood pressure there is no danger of damaging the arteries. Its use has in many cases the further justification of making good a deficiency

in the secretion of adrenaline, just as thyroid preparations do good in myxœdema. The treatment also reproduces the way in which relief may on rare occasions occur under natural conditions. If an individual during a severe attack of asthma comes under the influence of sudden fear or anger, the two emotions which Cannon showed stimulate the secretion of adrenaline, the attack immediately ceases, the patient having had an "autogenous dose" of adrenaline. We may hope that the time will come when asthma will be curable, but until that consummation has been attained the proper use of adrenaline deprives asthma of most of its terrors and makes it possible for every asthmatic to live a life of moderate activity. Before its introduction many asthmatics rarely slept for more than three or four hours a night, and the morning found them exhausted by the long-continued fight for breath. Now it is unnecessary for any asthmatic to resort to hypnotics, as even if he has three or four attacks in the night the prompt injection of the right dose of adrenaline will each time send him to sleep within a few minutes.

The rare condition of status asthmaticus, in which severe asthma continues uninterruptedly for days or weeks and may end in fatal exhaustion, can always be arrested by the method of continuous adrenaline injection, which I introduced a few years ago, and which we have since found is equally effective in the treatment of anaphylactic shock. The needle is kept constantly in position, and after an initial injection of a dose which is known to cause no unpleasant symptoms, such as two or three minims, one or more minims are injected every fifteen, thirty, or sixty seconds, according to the patient's reaction, the rate being varied until it is found how frequently the injection can be made without any unpleasant symptoms arising. The injections are continued, if necessary, for even half an hour or more; relief always follows and generally manifests itself by the patient falling into a deep sleep, which is often the first he has had for several days.

During the last few years a vegetable product, ephedrine, has been much employed as a substitute for adrenaline. Its chemical constitution is very similar, and it has the advantages of acting when taken by the mouth, whereas adrenaline is destroyed in the stomach, and of producing a much more prolonged effect. But it acts less rapidly and only controls minor degrees of bronchial spasm, being quite useless in the treatment of severe paroxysms. It is especially useful in overcoming the slight dyspnoea and wheeziness from which many asthmatics suffer in the intervals between attacks, and it is a very useful prophylactic when taken before going for a walk or doing anything else which is known by past experience to be likely to bring on a mild attack. Sometimes, when taken in the evening, it prevents an attack in the night, but occasionally it has the disadvantage of causing insomnia.

As the increased positive intrathoracic pressure during forced expiration increases the bronchial obstruction in an attack of asthma, whereas the negative pressure during inspiration diminishes it, the dyspnoea of asthma is characterized by being mainly expiratory. The result is that from the onset of the attack the lungs are in a state of full expansion, which after a time tends to persist in the intervals between attacks, especially if, as is often the case, the spasm does not completely disappear. The distended condition of the lungs is not true emphysema, as the latter depends upon permanent structural changes in the tissues of the lungs, which make it impossible for them to be restored to their normal size. On the other hand, the distended lungs of the asthmatic remain capable of contracting unless secondary emphysema has occurred as a result of associated chronic bronchitis. The distended lungs are in a condition of great disadvantage, as there is no means of increasing their capacity when exertion calls for more oxygen. It is therefore of the greatest importance to teach every asthmatic to perform regular expiratory exercises; by means of which



his barrel-shaped chest and shrugged shoulders become much less obvious, and in the case of children often disappear completely. Corresponding with this his capacity for taking exercise is enormously increased, as deep inspiration now becomes as easy as deep expiration. Ordinary breathing exercises are quite useless, if not actually harmful. Each exercise should begin with expiration, and an effort is made by active and passive movements to restore the thorax to a normal position of rest, after which diaphragmatic breathing with the mouth closed and the body fully relaxed should be taught.

### The Treatment of Pneumonia.

By ROBERT J. ROWLETTE, M.D., F.R.C.P.I.

(Abstracted from *The Medical Press*, October 16th, 1929, p. 317.)

It is not necessary to describe the pathological anatomy of the disease—lobar pneumonia—the treatment of which we are about to discuss, partly because you probably have an adequate notion of it, and partly because concentration on the pathological anatomy of the lungs is likely to mislead us as to the real pathological process of the disease. The patient who dies of pneumonia, dies, not directly of the condition of his lungs, but of toxæmia, and as a rule the part fatally damaged by the toxin is the heart muscle. The great majority of fatal cases of pneumonia die from heart failure. No doubt the heart is damaged not only by the toxins of the disease, but also by the inadequacy of oxygenation of the blood and by the fatigue of dyspnoea, but these influences, while important, are only secondary. We should consider, therefore, to arrive at the proper point of view for treatment: (1) the toxæmia, (2) the heart.

Is there any way in which we can counteract or diminish toxæmia? We think at once of vaccines and serums, and both have been used, and both have given service in certain cases. Take vaccines first. There is, at present, an ill-founded prejudice against the use of vaccines in acute diseases. Such prejudice is based on ignorant use of a method of treatment which, carelessly handled, may readily prove dangerous. When given in small doses vaccines are entirely harmless, no matter how acute the disease. Whether they will be helpful or not is a matter to be decided by experience in regard to each particular disease. In the case of pneumonia my own experience, and that of many others, is that vaccines play only a small part in treatment. After the first few days I have seen no effect from their use in such doses as I thought fit to use them. (This is in marked contrast to the streptococcal infections, including septic pneumonia, in which vaccines at any stage of the disease are not infrequently followed by dramatic improvement.) But in the first few days of acute pneumonia there is fair evidence of the utility of pneumococcal vaccine. If I see a case of pneumonia in the first or second day—a rare happening—and if evidence of toxæmia is slight, I give a dose of 15-25,000,000 pneumococci. In many cases the disease aborts, and a normal temperature is reached in twelve to twenty-four hours. It is true, also, that in many cases one is unable to see any alteration of the progress of the disease. Such a dose, given at a later stage of the disease, when toxæmia is established, would be definitely dangerous.

Serums raise a different problem. There are, we know, four types of pneumococcal infection, and only against one of them, type I (covering 30 to 40 per cent. of the cases), has a fairly effective serum been produced, and against type II a less effective substance. As laboratory facilities for typing are rarely available rapidly enough to be of use, one is driven to employing a polyvalent serum. Felton's preparation seems the best. Large doses have to be given; 10,000 units should be given intravenously as early as possible, and doses should be repeated at intervals of eight to twelve hours as long as the temperature remains high. As

much as 500,000 units is sometimes administered. Up to the present the serum has been little used in these countries. The expense, the disturbance caused by repeated intravenous medication, and the doubts as to the reality of the results have stood in the way. In a really serious case one ought not to hesitate to use the serum.

Every few years for many years past some drug has been introduced with the hope of combating the bacteriæmia by direct bactericidal action. Among those most talked of are mercuriochrome and, more recently, sodium nucleinate, the former given intravenously, the latter intramuscularly. Mercuriochrome is said to have given dramatically good results in a few cases, but it has also caused deaths, and as knowledge stands at present, its merits are not sufficiently heavy to outweigh its risk. For sodium nucleinate there is little evidence of its being of any value. We have to admit that we have not as yet at our disposal any antiseptic drug which efficiently reduces the bacterial content of the blood or the tissues. In addition all of them are dangerous to the subject.

We find, therefore, that our first line of treatment in pneumonia—or toxæmia—is rather disappointing from the practical point of view. We are driven then to concentrating on the heart. In speaking of pneumonia one may indulge in a paradox. In no disease does the result depend more on treatment; in none is recovery so emphatically the work of nature.

The fact is that our whole therapeutic energy in regard to pneumonia is devoted to giving nature every chance to work a cure, and fortunately we are able to give very definite help. One main principle must be to save the heart all possible exertion—to make its labour as light as possible. The patient must never be allowed to move himself; physical examination, once the diagnosis is made, should be the least possible; in no case should the patient be allowed to sit up for examination or any other purpose; he must be fed by the nurse, and drinks and spitting-cup handed to him, and his mouth wiped after spitting. Anything that hampers breathing throws work on the heart. The patient must be put in the attitude in which breathing takes place most easily, usually a semi-upright position on a bed-rest. Care must be taken to keep him in this position, as he is, through weakness, likely to slip into a crouched position in which breathing is difficult. Raising the feet of the bed on blocks helps.

Pressure on the diaphragm from below must be prevented. The bowels must, therefore, be kept free by simple aperients or by enema, and above all, flatulence must be avoided. Flatulence is not merely a troublesome symptom, but a condition fraught with danger. It is usually the result of over-feeding or injudicious feeding.

Sleep is all-important, and the methods of procuring sleep have given rise to much debate. The ordinary arrangements for comfort—quietness, sponging of face and hands, or of more of the body, freshening of the bed-clothes, or change of night-shirt—tend to produce a condition in which sleep is possible, even if, of themselves, they are inadequate. If drugs are necessary, I know only one which can be relied on—morphia. In the first few days of pneumonia it can be given with complete safety, and sleep during the first few days is the best asset with which the patient can face the three or four more strenuous days that are to follow. In many cases morphia can be given with safety right through the disease, but if cyanosis be present with much dyspnoea its use is attended with risk, and one would only use it after grave consideration. I have seen it so given in one case of pneumonia to a patient who had been sleepless and delirious for several nights, whose face was plum-coloured, and whose dyspnoea was extreme. It brought him to the point of death, but it saved his life. If morphia is contra-indicated, paraldehyde is probably the most trustworthy and safest drug to use, but its taste is abominable. Sulphonal is safe, but often fails; it should be given several hours in advance of sleeping time. Chloral

hydrate should be avoided, and the so-called antipyrin and antifebrin, are poisonous. Bromides help to quiet delirium, but do little directly to induce sleep.

The clothing should prevent chill, but should not be heavy, and should not encumber breathing. The so-called "pneumonia jacket"—an admirable thing for a wounded man on a stretcher journey—is a deadly instrument in pneumonia.

If fever is high, tepid or cold sponging is the only permissible treatment. My own usage is to order a tepid sponge if the temperature reaches  $101^{\circ}$ , and a cold sponge if it reaches  $105^{\circ}$ . It must be remembered that, although occasional sponging is refreshing, frequent sponging is fatiguing and must be avoided. Antipyretic drugs—even so mild a drug as aspirin—should not be given.

Pain must be relieved, if present in the early days of the disease. Here morphia may be used, or often a linseed poultice is enough. The poultice should not be left on for more than one and a half hours, and should not be applied more often than twice a day, with an interval between. Continuous poulticing is intensely fatiguing, and is hampering to the breathing; an occasional poultice relieves pain and keeps the local circulation active. It is true that an ice-bag also relieves pain, but its other effects are not helpful, even if they are not positively harmful. It is never wise to check the blood supply to an inflamed area.

You will notice that I have said little about the use of drugs. Drugs have little place in the treatment of pneumonia. I have spoken of hypnotics. What of expectorants? They have little effect. Small doses of potassium iodide in the first few days may loosen the mucous secretion and render it more easy to expel.

Later, drugs tend to upset the digestion without doing any counterbalancing good. There is no evidence that digitalis does any good to the heart in the ordinary course of pneumonia, and it is likely to upset the stomach.

Food should be light, given in small quantities, and the greatest care should be taken that the stomach is not over-loaded, and that the food is digested. Vomiting, flatulence, undigested food in the stools, are evidence of error in diet. What of alcohol? We have passed through many phases of thought as regards the use of alcohol in pneumonia. At one time it was believed that the more alcohol a patient was persuaded to swallow the better his chance of recovery; at another, alcohol was regarded as a poison, useless and harmful. Neither view is, in my opinion, correct. Alcohol is not a stimulant. Its effect in stimulating the heart is reflex only, momentary, and in a continued illness, negligible. It is, however, a food, and the most readily absorbed of all foods. In many cases, I have no doubt that alcohol, as a food, supplies the margin of strength required to carry a patient through the final few days to the crisis. Given as a routine through every case of pneumonia from rigor to crisis, it more often does harm than good. To withhold it in every case is equally bad. My own attitude is this: I rarely give it early in the disease, except to alcoholics, but even in non-alcoholics a half glass of hot whisky at night conduces to sleep and comfort. When, however, the crisis is to be expected at any time, if the illness has been severe, if breathing is laboured and ineffective, colour bad, and the pulse weak, and little nourishment is being taken, alcohol often gives great help. I believe, however, that it should be kept for such emergencies, and that a large majority of cases of pneumonia go safely through without resorting to it.

The question of the use of oxygen may arise. In many cases of severe cyanosis oxygen gives much relief, causing improvement in the colour, and giving ease to the patient. It may be administered by a nasal catheter, continuously, if possible, but the gas should be warmed in transit. Closed apparatus, although supplying oxygen in stronger concentration and therefore theoretically more effective, may cause discomfort, and embarrass the breathing movements.

You will note that the treatment of pneumonia is, in

my opinion, thoroughly conservative, and probably differs little, if at all, from what you saw practised when you were students, and what you are in the habit of practising yourselves. None of the varied "treatments" that have been put forward have showed any better results than are obtained by the simple methods I have outlined.

### A Note on the Shute Technique for Staining Malaria Parasites with Leishman's Stain and on the Stippling in Infected Red Blood Corpuscles which it Reveals.

By S. P. JAMES, M.D., D.P.H., I.M.S. (Retd.).

(Abstracted from *Trans. Royal Soc. Trop. Med. Hyg.*, Vol. XXIII, No. 3, November, 1929, p. 269.)

In order to obtain the best results the technique given below should be followed in every detail.

New microscope glass slides should be used. The slides with which the best results are obtained are those known in the trade as "half white"; the results may not be so good when slides known as "white" or as "French special" are used. The slides should be dipped in "nitric alcohol" (30 parts nitric acid, 70 parts absolute alcohol), and, after being wiped dry, should be kept in absolute alcohol. On no account should "methylated spirit" be used as a substitute for absolute alcohol in any part of the procedure of taking and staining blood films. The slides, after removal from absolute alcohol, should be rubbed dry with a clean soft cloth.

The stain is made with pure methyl alcohol ("free from acetone") and crystals of Leishman's stain. The reaction of the methyl alcohol must be tested before making up the stain. This is done with the aid of an outfit for determining the hydrogen ion concentration, the indicator used being phenol red, and the range of the standard tubes being from pH 6.6 to pH 8.0 (Baird and Tatlock's outfit No. P. 2759). Into the test-tube made of cordite glass which is supplied with the outfit, pipette 5 c.cm. of the methyl alcohol to be tested. With a separate pipette add 0.5 c.cm. of a 0.01 per cent. solution of phenol red. Shake and, after a moment or two, compare the tint with that in the standard tubes provided. Every brand of methyl alcohol which we have tested in this way gives a slightly acid reaction. After adding the indicator to 5 c.cm. of the brand which we use, the tint corresponds nearly always with that of the standard tube marked 6.8, but sometimes with that marked 6.6. It is our practice to discard supplies of methyl alcohol which are as acid as is indicated by the tube marked 6.6, and we have had to do so even with some supplies which makers put up in hermetically sealed tubes "for use in microscopic staining."

To make up the stain, rinse a glass stoppered bottle thoroughly with some of the methyl alcohol that will be used for the stain, and then put in 0.15 g. of Leishman's crystals (usually called "Leishman's powder"). Add 100 c.cm. of the methyl alcohol. Shake from time to time during the next 24 hours, after which period nearly all the crystals will be dissolved, and the stain will be ready for use. For several reasons it is unwise to make the solution in a pestle and mortar, or to filter it, as is usually recommended in textbooks.

Next deal with the distilled water which will be used in the staining process and for washing the stained slides. We work with a 1-litre flask of distilled water which has been treated as follows: Shake up the water in the flask and wash out a 5 c.cm. pipette with water from it; test 5 c.cm. of the water in the same way as was described for testing the methyl alcohol. Probably the water will be found to be at least as acid as is indicated by the standard tube marked 6.6. Add to the water three or four drops of a saturated filtered solution of lithium carbonate, shake the flask to ensure thorough mixing, and repeat the test. Continue the procedure of adding one or two drops of the lithium carbonate solution and of testing until the water in the

flask becomes exactly of an alkalinity indicated by observing that, after adding 0.5 c.cm. of the phenol red solution to 5 c.cm. of the water, the resulting colour matches the colour of the solution in the standard tube marked 7.2. This is the degree of alkalinity that must be reached when the methyl alcohol is of an acidity represented by the tube marked 6.8.

To stain a blood film, drop four drops of the staining solution on the film, rock for ten seconds, add twelve drops of the distilled water, and mix thoroughly by tilting and rocking. We do not use a glass rod for mixing the water and the stain on the slide, because a rod often carries specks of dust or of cotton fibre which are transferred to the slide; but a good deal of practice in tilting and rocking the slide is required in order to obtain quick and complete mixing of the water and the stain without spilling some of it off the slide, or on the fingers, and without allowing any of the stain to dry on the film before the water has reached it. Nor do we employ the usual practice of making a barrier with a wax pencil across the proximal end of the slide, because, when this is done, particles of methylene blue from the pencil invariably become mixed with the stain and alter the result. By using four drops of stain and twelve drops of distilled water, the stain is diluted three times which, we think, gives the best results. Four drops of stain, carefully applied, are quite sufficient to cover a film and, when twelve drops of water are added, the amount of fluid on the slide is easy to manipulate so that none spills off the slide or reaches the fingers. We time the ten seconds during which the stain alone is on the film by a watch with a large second hand.

The length of time during which the stain is allowed to act on the film is very important. When dealing with a film about which we do not know the species of malaria parasite present, thirty minutes is the correct period during which the stain should be allowed to act; for although the older stages of the parasites present will be too deeply stained, that period is necessary for bringing out clearly the stippling in red blood corpuscles infected with quartan parasites and Schuffner's dots and Maurer's spots in the youngest ring or marginal stages of corpuscles infected with *P. vivax* or *P. falciparum*.

When we know what species of parasite is present in the films, the period of staining should be varied according to whether it is desired particularly to study the morphology of the parasites or the stippling and other changes in the red blood corpuscles containing them. The parasites stain much more quickly than the changes indicated by stippling or dotting of the red blood corpuscles; and Schuffner's dots stain more quickly than Maurer's spots or the stippling characteristic of a quartan infection. After staining for ten minutes Schuffner's dots, characteristic of infection with *P. vivax*, are vividly stained in all corpuscles containing quarter to half-grown and later stages of the parasite, but in that period no stippling can be seen either in corpuscles infected with the youngest forms of this parasite or in any corpuscles infected with *P. malariae*. Stippling of corpuscles infected with the latter parasite is best studied in films stained for 45 minutes, though it is well seen in most (though not in all) infected corpuscles after 30 minutes staining. For routine identification work 30 minutes is the best time.

On the termination of staining, the stain must not be poured off the slide before beginning to wash the film; a good stream of distilled water must be applied at once so that all stain and deposit is flushed off in the first moment. Washing in the stream of distilled water should be continued for fifteen seconds by the watch.

#### *Stippling of Red Cells in Quartan Malaria.*

The dots in the three species of plasmodium have the following distinguishing features.

(1) Schuffner's dots are relatively large and round, numerous and very distinct; their colour shades from deep mauve through violet to pale rose; (2) the quartan stippling consists of numerous separate dots

and points, smaller than Schuffner's dots and not so definitely round nor so distinct; their colour is the same as that of Schuffner's dots, but more of them are pale rose. In corpuscles containing quartan parasites which nearly fill the corpuscle, the dots are nearly as large as Schuffner's dots, but they are fewer in number, and they stain faintly pale rose. Their reaction to staining is evidently quite different from that of Schuffner's dots because, while Schuffner's dots can be demonstrated readily in films stained for only five minutes in the manner described, the stippling of cells containing quartan parasites is not demonstrable until the film has been stained for at least twenty minutes, and is best brought out by staining the films from thirty to forty-five minutes. This is why we recommend thirty minutes as the period of staining for routine identification work. It will be remembered that Maurer, to obtain his "third and fourth degrees of staining," which showed the stippling of infected corpuscles best, recommended that films should be stained for one hour. Evidently in modern practice much is sacrificed to the demand for quick results; for example, in the ninth edition of *Manson's Tropical Diseases*, p. 859, five minutes is the period recommended for staining with Leishman's stain. (3) Maurer's spots are few in number, and larger and of more irregular shape than the dots in either of the other types; their number can always be counted, and some of them are tiny rings, loops or streaks; their colour is deep mauve to violet, and the corpuscle itself is pale blue-grey, and often outlined sharply by the rose stain.

#### **Undulant Fever (Malta or "Abortus" Fever).**

(Abstracted from *The Prescriber*, Vol. XXIII, No. 9, September, 1929, p. 303.)

For many years an infection of cattle, causing epidemic abortion in the animals, has been recognized. The causative organism was isolated by Bang in 1897, and named by him *Bacillus abortus*. Though the possibility of infection of man by this organism has been suspected, until quite recently very few cases of such infection have been reported.

About forty years ago much trouble was caused in Malta by the prevalence of a certain kind of fever among the troops and the civilian population. The organism of this fever—termed Malta fever and later Mediterranean fever—was isolated by Bruce in 1887 and termed by him *Micrococcus melitensis*. In 1906 a British Commission investigated the causes of Malta fever and traced its origin to goats, whose milk was being largely consumed by the troops on the island. Removal of the goats and stoppage of the consumption of their milk completely stamped out the disease among the troops and greatly diminished its incidence among the civilian population. Later it was observed that the incidence of Malta fever in goats was accompanied by frequent abortion among the animals, and in 1918 Alice Evans demonstrated a certain similarity between *B. abortus* and *M. melitensis*. While the absolute identity of the two organisms has not been definitely settled, their similarity morphologically and biochemically is generally recognized, and it is known that the diseases they cause in man are very similar in character.

Considerable further evidence regarding the unity of the two organisms has been produced.

This being the position, the possibility of the existence of the disease in this country and in America led to investigation, with the result that a number of cases of infection with *Brucella abortus* have been recognized. The symptoms do not appear always to be typical of undulant fever as it has been seen in the tropics, but the finding of the organism, or the application of agglutination tests, has established the identity of the disease. Harrison and Wilson have examined a number of serums from cases of pyrexia of unknown origin and show beyond doubt that *Br. abortus* is capable of infecting human beings in Great Britain. Giordano and Ableson applied the agglutination test to 1,100

specimens of blood, and detected fourteen cases of undulant fever, apparently of the abortus type, the cases presenting a varied clinical picture. These results call for closer investigation; meanwhile it is most desirable that in all cases of undiagnosed pyrexia or indefinite febrile symptoms blood cultures and agglutination tests should be made.

Amoss and Poston have demonstrated the possibility of isolating *Brucella* organisms from the faeces of patients. In ordinary cultivation the normal intestinal flora overgrows the *Brucella* organism, but by clumping with immune serum the colonies become apparent. The method may be found useful in diagnosis when agglutinins are not detectable in the serum and the blood culture is negative.

Recognition of the existence of this disease in our midst has brought to light numerous cases during the past few years. Typical undulant fever (*Br. melitensis*) is characterized, according to Manson-Bahr, by a series of febrile attacks, each attack lasting one or more weeks and subsiding into a period of absolute or relative apyrexia of uncertain duration. Common complications are a rheumatic-like affection of joints, profuse diaphoresis, anemia, liability to orchitis, and neuralgia. Although only occasionally fatal, the disease is a fruitful source of inefficiency and invaliding. The incubation period varies from six to fifteen days. Osler and McCrae state that the fever (the chart of which shows typical undulations) does not yield to quinine; also that there is an intermittent type, in which the patient may simply have daily pyrexia towards evening, and may be able to continue his work during the day. In "abortus" fever the symptoms are not always those of undulant fever: they vary considerably, as will be seen from the following paragraphs.

One of the earliest cases of abortus infection to be recorded was described by Keefer in 1924. This case occurred in Baltimore. Hardy in 1928 urged that the matter should be taken up by State and municipal laboratories, so that cases of unrecognized fever might have the benefit of accurate blood tests. He believes that the diagnosis of undulant fever in many cases hitherto unrecognized as such will modify the present conception of its clinical course. It is possible, he thinks, that many mild and comparatively short illnesses are due to *Br. abortus*, in which case suitable preventive measures ought to be taken. Kern thinks that the disease is more common among human beings in America than is generally supposed, and that failure to recognize it in its early stages is due to its variable clinical picture.

During 1927-28 numerous cases of undulant fever were reported from various countries, including Britain, America, France, Germany, Denmark, and Italy. These reports are summarized by Professor Madsen (League of Nations), who states that during that time 2,500 serums were examined at the State Serum Institute of Denmark, and of these 222 gave a definite positive reaction with *Br. abortus*. In almost all the cases the infection could be traced directly or indirectly to cattle or to milk. Fifty serums were examined from a district in Greenland, where there are no cattle, and all gave a negative reaction.

The present year (1929) has seen a great accession to the literature on the subject. Thomson who precedes his report with a review of recent literature—reports a case occurring in 1928. It was one of unexplained pyrexia lasting three weeks, and associated with rigors at intervals. The first diagnosis was malaria, but no parasites were found in the blood. Typhoid and paratyphoid were ruled out by agglutination tests, but the blood agglutinated with *Br. melitensis* and with *Br. abortus*. The infection was evidently due to cow's milk. Vaccines of both organisms gave no result. The patient slowly recovered under careful symptomatic treatment.

A case occurring in Newcastle-upon-Tyne is described by Charles and Warren. Infection was undoubtedly traceable to a cow. Another case, in Bristol, is reported by Todd. The disease was identified by agglutination

tests, and the milk consumed in the house gave a positive culture of *Br. abortus*. Autogenous vaccine had no effect.

In a lengthy article, Hardy gives a clinical analysis of 125 cases diagnosed as undulant fever and occurring in Iowa during 1927-28. Most of the patients were farmers and packing-house workers living on farms or in country towns. There was a striking variability in the symptomatology and course—weakness, sweating, fever, chilliness, anorexia, constipation, and loss of weight were the preponderating symptoms, but in many cases one or other of these was absent. Enlarged spleen was frequently observed. The temperature was generally intermittent or remittent, and undulations were not often apparent. The diagnosis was confirmed in all cases by agglutination tests.

Jenkins reports a case occurring in Florida in 1928. The peculiarity of this case was the unilateral character of the symptoms, the headache, pleurisy, and abdominal tenderness all being on the left side. He emphasizes the necessity for agglutination tests in all cases of undiagnosed fever, as fever is the only constant symptom.

Manson-Bahr and Willoughby present an interesting study of six cases of undulant fever treated at the Hospital for Tropical Diseases, London, during the last eight years. The almost universal distribution of the disease is shown by the countries from which the patients hailed—India, East Africa, Peru, England—though no cases came from the Mediterranean. The first diagnostic impressions were: typhoid in four cases, malaria in one, and influenza in one. Arthritic pain was a constant and characteristic feature. The headache of the early stages had a character of its own: it was less dull than that of typhoid, but it caused intractable insomnia. The epistaxis which occurs early in typhoid was correspondingly late in undulant fever. Profuse sweating occurred in all cases. The temperature showed curious rhythmical variations. Splenomegaly was present in every case and should be regarded as a prominent factor in diagnosis. Agglutination tests (macroscopical) proved of diagnostic value in all the cases, while the intradermal "melitene" test of Burnet was successful in three cases, the skin reaction remaining visible for forty-eight hours.

Davies and Anderson report a case from Wales, the duration of which was at least nine weeks. The case was one of pyrexia of unknown origin until the blood was submitted to the agglutination test, when the cause of the infection was discovered. No local source for the infection could be traced.

Gilmour reports a case from New Zealand. The patient, a man aged 20, soon recovered, though the temperature ran an undulatory course for several weeks. The agglutination test was positive.

A rather peculiar case is reported by Cuatrecasas and Tornel in which the calcium metabolism appeared to be affected, with the result that spontaneous fracture took place on slight movement. The agglutination test was negative, but the authors are of opinion that the symptoms were those of Malta fever.

*Treatment.*—This is mostly symptomatic. The fever is kept under by ordinary physical measures, not by drugs. Quinine, as already stated, has no effect; salicylates are useless, while the use of phenacetin and other antipyretics is undesirable in so chronic and asthenic a disease.

Vaccines have been found by most observers here and in America to be useless, but Wendt states that he had good results in three cases with a vaccine of *Br. abortus*, and Cambessèdes and Garnier claim to have cured a number of patients with large doses of a similar vaccine. Manson-Bahr says that in intractable cases an autogenous vaccine certainly helps to lower the temperature and bring about clinical improvement.

Zanzucchi claims to have immunized cows with a vaccine prepared from *Br. abortus*, thereby rendering the animals harmless to human beings.

In one of the cases treated by Manson-Bahr and Willoughby the fever appeared to be modified by

intravenous injections of *cusol*, double strength, 50 c.c. doses. Injections of *mercurochrome* are said to have done good, while *acriflavine* has given good results in some hands. Hoffman used *acriflavine* in two cases, with the result that the duration of the disease was definitely shortened. The drug was given intravenously in doses of 0.1 to 0.4 gm., and Hoffman advocates its trial in other cases, as if properly given it can do no harm.

### Eye Strain at Different Ages.

By EDWARD JACKSON.

(*American Journal of Ophthalmology*, Vol. XII, No. 6, June, 1929, p. 510.)

Eye strain is generally nerve strain from use of eyes. Its unusual and rare effects may be found as widely distributed as the important nerve connections and nerve functions of the body. The form in which the strain is likely to be manifest is connected to some extent with the age of the patient. Eye strain may cause either sensory or motor disturbances. The former are more commonly recognized, but the latter are also important.

In early childhood the convergent strabismus associated with hyperopia is the most frequent and important effect of strain of accommodation, and in a large part of the cases the squint is permanently cured by complete removal of that cause. This should be the first thought of the oculist as to such cases. Twitchings of the lids and face, choreic movements, and even epileptiform seizures, arise from eye strain in a few cases. Usually they are associated with exceptionally high ametropia; but a moderate error of refraction, influencing a defective nervous system or the sequels of acute disease, may help to establish or perpetuate such disorders. In rare cases young children have nausea and vomiting from eye strain—car sickness—when riding on electric or steam trains; and marked migranous attacks of headache may be due to eye strain.

During school life eye strain due to ametropia, or to bad habits in using the eyes, is the most common cause of headache; and a large proportion of the recurring or habitual headaches of adult life have been established at this time. This is the period for the production of myopia, by undue and continuous exercise of convergence. Myopia is not commonly attended with headache, although astigmatism, which may help to cause or increase myopia, may also cause headache. Many cases of habitual headache, encountered later, have been developed and fixed by eye strain at this period. More directly connected with the eye strain of myopia is a form of aching of the eyeball, particularly likely to come on when myopia is developing. With myopia, although sometimes without it, may come exophoria accompanied by headache and vertigo, in other words muscular asthenopia.

In early adult life, the habits and occupation of the patient are most likely to determine the occurrence of eye strain. Those who live chiefly outdoor lives commonly escape; although astigmatism and high hyperopia may cause strain at this time. Likely to cause eye strain are indoor occupations such as needle-work, writing by pen or machine, most kinds of office work, watching faces (as by teachers or salesmen), fine mechanical trades, and the reading required in various professions. Among these people, headache is still the most common manifestation. But many other symptoms may be traced to eye strain as the sole or a contributing cause. Anorexia, dyspepsia, nausea, poor nutrition, anemia, and other chronic departures from health should suggest inquiry into this as one of the possible causes of impaired health.

With middle age, diminished power of accommodation may cause eye strain in one whose eyes have previously given perfectly satisfactory service without undue nerve effort. Headaches, vertigo, and nausea may develop, and there is also a susceptibility of conjunctival irritation or inflammation. This is not quite the same

form as arises in childhood. But ocular hyperæmia, burning, and inflammation from this cause may persist and recur in spite of local applications. These cases are difficult to distinguish from what is often regarded as a senile degenerative change in the conjunctiva. The association of symptoms with use of the eyes in near seeing generally suggests that eye strain has arisen, although in a patient previously free from it. At this age mental disturbances arising from eye strain have been reported by well known and qualified observers. The relief afforded by removing the strain is often necessary to establish the diagnosis.

After fifty years of age, it is sometimes supposed that accommodation has become unimportant in causing eye strain. This is not the case. Accommodation may be important until after 70 and often is important until after 60. The glasses worn for presbyopia often allow the avoidance of eye strain when reading, by shifting the book a little farther away or by looking through the glass obliquely. But for distant vision these resources to save the eyes from strain are not available, and at this time of life the strain is often felt more in distant vision than for near. In patients accustomed to distinct vision, low hyperopia or astigmatism that never caused eye strain in early life may cause it when the whole accommodation is only a little more than the error of refraction.

The patient accustomed to distinct vision all his life will not willingly give it up. And the low error that he can overcome is more likely to cause strain than a higher fault of focus that could not be corrected by his ciliary muscle for more than a few minutes at a time. The symptoms of eye strain coming on gradually, at a time of life when it is not expected, are very likely to be overlooked or misinterpreted. Most patients cannot give a definite account of their trouble. One careful measurement of the refraction, with the therapeutic test of wearing glasses for distant vision, may settle the diagnosis. The symptoms may be some of those encountered earlier in life, but often they will not be typical and characteristic, as in younger patients. Excessive lacrimation may be present, or inability to concentrate attention on what is read. The disturbance is apt to be thought of as merely senile. The suffering from headache may be less acute than in younger people. But relief from it will be equally appreciated. Even when not expected, eye strain must be kept in mind and considered as a possible cause for symptoms.

## Reviews.

**TROPICAL MEDICINE.**—By Sir Leonard Rogers, C.I.E., F.R.S. and Major-General J. W. D. Megaw, C.I.E., V.H.S., I.M.S. Pp. 536 with 2 colour plates and 76 other illustrations. 1930. London: J. & A. Churchill. Price, 14s.

THE publication of this excellent book will arouse widespread interest among medical men practising in the tropics, and especially in India. The well known previous textbooks on tropical medicine have become rather voluminous in their recent editions, correspondingly expensive, and laborious to read; they appeal almost more to the consultant and laboratory worker than to the general practitioner. And in this connection the authors have made every attempt to make this book concise, yet sufficient, to cut out all redundant matter, but to include all information necessary and to bring the subject up to date. Thus the book is pre-eminently one for the medical student and the young general practitioner in the tropics. The style of both authors is brief and lucid, yet it is amazing what an amount of matter is included within the short compass of 525 pages.

Secondly, the pre-eminent merit of the book is that it is a publication by two of the outstanding men in the world of tropical medicine with long experience of medical work in India. When a distinguished former



Professor of Pathology at the Calcutta Medical College, and a distinguished former Director and Professor of Tropical Medicine at the Calcutta School of Tropical Medicine collaborate to write a handbook on tropical medicine, the results are bound to be of interest, for each of the authors has made notable contributions to the study of many of the special tropical diseases concerned. Among the sections contributed by Sir Leonard Rogers one naturally finds kala-azar, amebic hepatitis, amebic and bacillary dysentery, cholera, sprue, leprosy, and snake venoms; in all these subjects Sir Leonard Rogers is an outstanding authority. Major-General Megaw's contributions include the chapters on spirochætal diseases, the dengue-sandfly group of fevers, the typhus group, dietary and deficiency diseases including beriberi and epidemic dropsy, and the concluding and brief chapter on hints on the use of the microscope. The result is that, despite its brevity, the book is authoritative.

Thirdly, the price of the volume is studiously moderate, 14s., or about Rs. 9. In spite of this its standard of publication is very high, and both authors and publishers are to be congratulated in this matter. The illustrations are admirable; they are almost all original, and include several which graphically depict the "story" of a disease, day by day, from its mode of acquisition to its termination, and numerous collections of types of temperature charts in different diseases, drawn in bold relief, and understandable at a glance. Of special interest to readers in India will be the numerous small maps showing the distribution, area by area, of the principal tropical diseases in India.

The framework of the book is clever, for the authors break away from tradition and consider in turn fevers due to protozoal infections, to spirochætal parasites, those of uncertain origin, those due to Rickettsia bodies; then in turn bowel diseases, diseases especially associated with skin lesions, helminthic diseases, snake poisons, diseases associated with diet, and those caused by heat and light. In the present state of our knowledge with regard to tropical diseases, it seems impossible to suggest a better classification, for parasitic and metabolic diseases are here sharply differentiated from one another, and the book opens with malaria—a subject dealt with in an admirable summary of 80 pages.

We do not propose to review the book in further detail, as we anticipate that the majority of our readers will soon be studying it, but certain features call for comment. Year by year Sir Leonard Rogers has contributed the articles on tropical diseases to the *Medical Annual*, and it is probably owing to this, and also to his indefatigable industry that he is able to convey so much information in so small a compass. Thus the chapter on amebic hepatitis only occupies 15 pages, but is a most important contribution to the literature in tropical medicine as a summary of the revolution in the treatment of that condition which the last twenty years has seen. The sections of the book dealing with spirochætal diseases are very well written. The section on amebic dysentery is important, but we regret to see the term "cyst carriers" still in use; it should disappear from the literature, now that the true pathology of the carrier state has been worked out by several well-known workers. Cholera is dealt with in an excellent essay-review of 27 pages of special interest; but in a future edition we believe that the use of bacteriophage will have to be mentioned. The chapter on leprosy is again an admirable summary and very well illustrated. The brief discussion as to whether a light infection with ankylostomiasis does or does not exert any serious deleterious effects in man is very timely, for the question is one on which controversy has raged. In the section on filariasis Sir Leonard Rogers breaks away from the erroneous view—still generally taught in medical schools in India—that the lymphatic obstruction is due to the liberation of immature "ova" by the parent worm; (such a viviparous parasite is as incapable of laying "ova" as is a horse); but perhaps he scarcely lays enough emphasis on the work of Acton and Sundar Rao which shows

that the blockage is due to worms repeatedly introduced by infected mosquitoes, travelling towards the deeper lymphatics, and caught up in the lymphatic glands, with secondary septic localised infection from some distant focus supervening. As the author rightly observes, autogenous vaccines of streptococci or staphylococci constitute the most hopeful line of treatment at present available, for if secondary septic infection be avoided, filarial infection tends to be a self limited disease (owing to final death of the filarise), and its more important sequelæ, such as elephantiasis, can be avoided.

The chapter on snake poisons is brief, but we agree with Sir Leonard Rogers in his remark on page 417 that his work of 1903-04 on the pharmacology of snake venoms has been too much ignored by recent writers, and are glad to see reproduced here the tracings showing death by respiratory paralysis in colubrine intoxication, and from vaso-motor paralysis in viperine poisoning.

Chapters 24 and 25 are of special value, for, dealing as they do with climatic conditions as a disease factor, and the incidence of general and cosmopolitan diseases in the tropics they contain useful information with regard to housing, clothing, railway travelling, in the tropics, and kindred matters, not usually found in a textbook on tropical medicine. The section on humidity and heat stroke is also well written and informative.

We believe that this book will make an immediate appeal to medical practitioners and students alike throughout India, for it is a concise, authoritative, and well written exposition on the subject of diseases in the tropics.

R. K.

- (i) **TWO ROSS-MANSON LETTERS.** Pp. 12. (ii) **THE MODE OF INFECTION IN MALARIA.** Three more Ross-Manson Letters. 1898. Pp. 20. Price, 5s. (iii) **LETTERS FROM ROME.**—By Dr. T. E. Charles. With Addenda. Pp. 78. (iv) **Letters from Sir Patrick Manson and General Gorgas to Sir Ronald Ross.** Pp. 3. Published by the Ross Institute, Putney Heath, London, S. W. 15. 1929-1930.

The full story of Sir Ronald Ross' ever memorable discovery with regard to the transmission of malaria is told in his *Memoirs*, a book which every research worker in medicine should read. The *Memoirs*, however, are now being supplemented by publication of the original letters and documents concerned, by the Ross Institute. As only one of the above four publications is marked with a price, we take it that these publications are chiefly for private circulation, but every large medical library in India should certainly possess a copy of each.

(i) The first contains a letter dated the 22nd August 1897 from Ross to Manson reporting his discovery of malarial oöcysts, with a photograph of his drawing of them from the original letter. A second letter, dated the 31st August, 1897, records the observation of oöcysts of later development, and Ross' firm (and correct) conviction that he was working on the right lines. An extract from Dr. G. C. Low's presidential address to the Royal Society of Tropical Medicine and Hygiene on the 18th October, 1929, summarising Ross' work, completes the brochure.

(ii) The second publication, the price of which is 5s., is more important. It commences with a prefatory note explaining the difference between the transmission cycle, as suggested by Manson, and the actual transmission by biting as discovered by Ross—a difference which was profound. The first letter, dated from Calcutta, 28th June, 1898, describes the discovery of "germinal rods" (sporozoites) within the oöcysts—again with photographs of the original drawings in the letter—and discusses what may happen to these germinal rods. A paragraph towards its conclusion speaks of his weariness of India, and his longing for a happier field of work. The second letter is dated the 6th July, 1898, and is the most fascinating of the whole series. In it Ross describes how he discovered the



salivary glands of the mosquito, their structure and function, and the invasion of them by the malarial sporozoites. "I am nearly blind and dead with exhaustion" he writes, "but triumphant. Expect one of the most wonderful things." The claim was certainly not too high, for the discovery supplied the last clue necessary for the working out of the complete cycle and the experimental transmission of infection from bird to bird by *Culex* mosquitoes. The third letter, dated three days later, gives further details of the salivary apparatus, and records actual successful transmission of the infection to clean birds by mosquito bites. "The battle of Athara was won." He is even more weary than ever of India, however, hopes to be sent home to join the Malaria Commission if one is appointed, but will take leave if he cannot be sent home on special duty.

This part of the letters is rightly made available to general readers, and a price put on it. It contains the three most important letters in the whole series.

(iii) The *Letters from Rome* deal with much more controversial matter. In the introduction Sir Ronald points out that he had completed his study of bird malaria, and had demonstrated the complete transmission cycle in *Culex* mosquitoes by the end of July, 1898 (as the second publication of the series confirms). He claims that Grassi's studies only commenced on the 15th July, 1898, and that his first successful transmission of malaria from man to man by *Anopheles* mosquitoes was reported on the 1st of November, 1898. Dr. Charles' letters from Rome to Sir Ronald Ross commenced three days after the latter event. (Dr. Edmonston Charles had previously been practising in Calcutta, but had returned to England. There he practised at Weymouth during the summer, but among the British colony in Rome during the winter. With full knowledge of the work being carried out both by Ross in India and by the Italian workers in Rome, and being also in correspondence with Sir Patrick Manson, he was a sort of intermediary between the different parties concerned. The publication of the letters, we take it, is to vindicate Sir Ronald's claims to priority in his great discovery.)

The first letter is dated the 4th November, 1898. It reports Grassi's success in transmitting human malaria by the bite of an infected *Anopheles*, comments on the thoroughness and carefulness of Bignami's studies on the disease,..... "Naturally you would like to have your work confirmed by men who have done such good pioneering already..... It has been a cause of surprise to me how very closely they have followed all that you have done, and how fluently they talk regarding details of your work. I need not assure you with what pride all Englishmen follow all you do."

The second letter, dated the 19th November, 1898, records that the Italian workers had made but little progress during the previous fortnight, discusses the classification of mosquitoes, whilst the writer was trying to secure a copy of Ficalbi's work on the Italian mosquitoes to send to Ross. In the third letter, dated the 25th November, 1898, Dr. Charles reports that he had shown some of Ross' preparations showing oöcysts of *Plasmodium relictum* on the third day after the infective feed, to Professor Grassi. He also makes a comment that atmospheric temperature may affect the development of the cycle. The fourth letter, dated the 2nd December, 1898, records the discovery by the Italian workers of oöcysts in *Anopheles claviger* (*Anopheles bifurcatus* Linn.) fed upon a patient with "crescents" in his blood, but states that the lateness of the season of the year militated against further progress. He believes that the Italian workers are following Ross' technique with regard to breeding and feeding mosquitoes. The fifth letter, 10th December, 1898, records the finding of malaria parasites in a patient bitten by an experimentally infected mosquito, but adds that the Italian workers had not yet demonstrated sporozoites in the salivary glands. The sixth letter, 16th December, 1898, is a discursive one, but states vaguely that the Italian workers were working on a "parallel line," and had "secured facts of great importance, not only from a scientific, but from a practical

point of view." The question of a parasite responsible for quotidian malaria is also raised. The seventh letter, 6th January, 1899, is an important one; it notes that Professor Grassi had identified a "dapple-winged" mosquito sent by Ross as *Anopheles pictus*. The former's work had been much delayed. Further experiments in transmission to man by infected mosquitoes, however, had succeeded, malignant tertian infection having been transmitted by *A. claviger*. The eighth letter, 14th January, 1899, is one of sympathy with regard to Ross' break-down in health; the writer explains, however, that, although Ross would be a very welcome visitor in Rome, it was doubtful whether he would be able to procure material for study, since the Italian workers were much too fully occupied with their own work to share their material with others.

Two "postscripts"—covering 35 pages—follow, in which Sir Ronald gives a résumé of the bitter controversy between himself and the Italian workers with regard to priority in the great discovery. Sir Ronald is perfectly correct when he claims that "the credit of discovering the general life-history of a group of organisms belongs to the person who first ascertains the life-history of one member of that group"; but his comments on the late Professor Grassi are exceedingly bitter, whilst the Government of India comes in for some caustic comments. "Looking at all these facts" writes Ross (in 1910), "I find it impossible to admit that the work of the Italians possesses the fundamental originality which they endeavour to claim for it. On the contrary, it was almost entirely stimulated, sustained, and guided by the work of Manson, MacCallum and myself—especially by the general solution of the problem contained in my investigations on the malaria of birds. Had it not been for the Indian work, I believe that the Italians would have been just as ignorant regarding the mosquito theory as they were ten years ago. On the other hand, had they never touched the subject, I am confident the work would have been just as thoroughly completed by Koch, the Commission of the Royal Society, myself, and others. In a word, the whole of the Italian work depended on my discovery of the zygotes.....when they took up the work it no longer presented any serious difficulties."

There comes next a short letter from Dr. C. W. Daniels in 1900 verifying that Ross had shown him specimens demonstrating the Proteosoma cycle, and also malarial zygotes in the stomach of a "dapple-winged" mosquito fed on a patient with malignant tertian malaria. A list of publications in chronological order follows, and then a note published in the *Journal of Tropical Medicine* (1901) by Dr. Salvatore Calandruccio which, in effect, accuses Grassi of stealing other people's discoveries—(a note which we wonder that the editor of that journal ever accepted for publication). A letter from Koch to Ross follows: he actually writes "I consider Grassi to be a rogue and a robber in scientific domains.....what he claims as his is either stolen or fabricated..... His immediate colleagues do not behave better, as I myself experienced." A note from Professor Laveran also defends Ross' claims, and a statement made by Lord Lister at a meeting of the British Medical Association in 1901.

It will be seen that the whole of this third publication is of an extremely controversial character.

(iv) The fourth publication consists of congratulatory letters to Ross from Sir Patrick Manson (1899, 1900) and General Gorgas (1914), the latter of whom states that but for Ross' work the Panama Canal could not have been built.

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(It is extremely difficult for a medical research worker of a later generation than Sir Ronald Ross, working under very much happier circumstances, to pass any opinion on this bitter and very old standing controversy. The case for Sir Ronald Ross is fully presented in his *Memoirs*, and he has full justification for documenting it by the publication of these four brochures. But one cannot but deplore the bitterness with which the late Professor Grassi is attacked. The

English-speaking world in tropical medicine has heard in full the case for Sir Ronald Ross, but we believe that linguistic difficulties have prevented it from hearing in full the case for the Italian workers.

Nothing can diminish the splendour of Sir Ronald Ross' great discovery; it was an amazing piece of work carried out by a lonely pioneer working under conditions of the very greatest difficulty, hardship, and financial distress (he had to pay the whole cost of his researches out of his own pocket). Also his claim to priority in the discovery of the method of transmission of infection in the Plasmodium must be admitted; the historical sequence of the papers published bears that out.

Yet, we believe that there is evidence to support the contention of the Italian workers that their work was carried out "independently" of that by Ross. A study of the literature leads us to the belief that whilst Ross was successfully—and finally triumphantly—working out the transmission cycle of bird malaria in *Culex* mosquitoes, the Italian workers were independently attempting to secure transmission of human malaria from man to man with different types of mosquitoes under experimentally controlled conditions, without—at first—trying to work out the life-cycle in the transmitting mosquito.

In any case the personal attacks upon the late Professor Grassi, in our opinion, are to be deplored. Grassi's claim to a niche in the temple of fame does not rest solely upon his work on malaria. He made notable contributions to the sciences of helminthology, entomology, and protozoology; in personality he was a man of modest and retiring disposition, and it is impossible to think of him as a robber and stealer of other men's secrets; in fact his whole work was of such high merit in every sphere that it could not have been the result of work by his subordinates which he appropriated. *De mortuis nil nisi bonum.*)

R. K.

**MEMORIES OF SIR PATRICK MANSON.**—By Sir Ronald Ross. Pp. 26. Published 1930.

THE publication of this little volume (which, we take it, is chiefly for private circulation, as no price is mentioned, but which has been sent to us for review) is an important event in the history of tropical medicine. As the author states in his preface, it is important that the *exact* truth should be known where discoveries of tremendous importance are concerned.

Sir Ronald Ross records how he first came to meet Manson in 1894, and how the latter demonstrated the malaria parasites to him, and convinced him of the truth of Laveran's great discovery of the parasites in 1880. Manson at the time had retired from China, and was practising in Cavendish Square; his work in China on the development of *Filaria bancrofti* in *Culex* mosquitoes had drawn his attention to mosquitoes as transmitters of human diseases, and he discussed with Ross the possibility that mosquitoes might convey malaria. Manson's discoveries with regard to the transmission of filariasis, however, were never really completed by him. In those early days no one had any knowledge of the bionomics or classification of mosquitoes (a fact which meant that Ross had later to face tremendous difficulties in his study of malaria transmission owing to this want of knowledge, and had to work out everything *de novo* for himself). Manson did not believe that the adult female mosquito lived for more than about a week; that the mosquitoes infected with filariasis died and fell into water supplies; and that man was infected by drinking this water. It was only in 1899 that Manson drew attention to the possibility of man becoming infected by the bite of the mosquito, and in 1901 that Low demonstrated the truth of infection *via* the bite. Ross also comments (rightly) on the importance of the earlier work of Lewis and Bancroft, which has never received the recognition which it deserves.

The fact which arrested Manson's attention with regard to malaria transmission was the "flagellation"

of malarial "crescents"—(i.e., the liberation of microgametes by the microgametocyte in shed blood). Whilst other observers had regarded this phenomenon as one of degeneration, Manson was convinced that it must constitute some part of the extra-human cycle of development; hence his reiterated advice to Ross to "follow the flagellum."

Sir Ronald next describes very briefly the course of his own discoveries, and his correspondence with Sir Patrick Manson. (To a large extent we believe that Sir Ronald Ross has himself to thank for the undue importance which has been attached to Sir Patrick Manson's share in the discovery, for in his earlier papers Ross is too modest and from motives of gratitude pays far too much credit to Manson. Manson throughout acted as philosopher and friend, he brought all the very influential pressure that he could exercise to ensure full publicity for Ross' discoveries, he was—in a way—Ross' publicity agent in Great Britain, where the medical profession took Ross' great discovery more seriously than did the medical profession in India. But, as Manson himself states, his chief connection with the great discovery was that he "discovered Ross.")

Manson's hypothesis—it was nothing more—was that mosquitoes ingested the malarial parasites from man; that the parasites "flagellated" inside the mosquito; that the mosquito then died and fell into water; and that man became infected by drinking this water. This was very far from the truth, and some of Ross' very valuable time was wasted in testing the second half of the hypothesis. The real facts were discovered by Ross, and the discovery meant a whole host of minor discoveries before the complete cycle was revealed;—that there were different sorts (genera) of mosquitoes, of which only one type transmitted malaria; the discovery and working out of the anatomy of the salivary glands of mosquitoes;—whilst the true meaning of "ex-flagellation" was demonstrated in the meantime by MacCallum in connection with *Haemoproteus* infection of birds.

Passing from a brief summary of his work in India on malaria, Sir Ronald Ross next comments very briefly on Manson's work in originating the London School of Tropical Medicine, and the publication of his *Tropical Diseases* in 1897. He criticises Manson's work as being more speculative than experimental in character; "Manson was made a Fellow of the Royal Society in 1900, chiefly, I think, because of his induction, and of my work on malaria." He complains of the want of interest by Sir Patrick Manson in the practical application of the results of Ross' discovery; "I must say that I was rather disappointed with Manson's attitude towards the whole subject of practical malarial prevention."

The volume ends on a note of disappointment. We are informed that Sir Ronald expects to spend the rest of his days over his new system of algebra, which he terms "Explicit Operations," and which has occupied him for 42 years. "Thirty years have now elapsed since my Indian work on malaria, but so far as I can ascertain little practical anti-malaria work has been attempted in the British Empire, except round European settlements, except by Watson,"—(a statement, which we believe does grave injustice to malarialogists in India and Ceylon, not to mention other parts of the British Empire). "This means that while so many medical gentlemen have been so correctly describing the achievements of Manson, many millions of people must have died of malaria in the British Empire during the period mentioned." But the book ends with a final admission that Manson's memory is far too great for association with any kind of falsehood.

*Memories of Sir Patrick Manson* contains rather more about the author than about Sir Patrick; yet we believe that the publication of this volume is important, since it may check the widespread—and erroneous—belief that Ross' great discovery was entirely inspired by and due to Manson. The real facts are very different; they are correctly recorded in this volume.

R. K.

**IMPRISONMENT.**—By Lieut.-Col. F. A. Barker, M.A., M.D., O.B.E., I.M.S., Inspector-General of Prisons, Punjab. Pp. 191. 1930. Madras, Christian Literature Society for India. Price, Rs. 1-8.

So many medical men in Government service in India of all grades are concerned in prison administration that the publication of this little paper-bound volume by Col. Barker will be very welcome. It is a presentation of the present position with regard to Indian prisons, and a suggestion for future policy and improvements, based on the author's long experience of prison administration in the Central Provinces, the Andamans, Madras Presidency, and the Punjab. In a foreword the Bishop of Madras writes as follows:—"Colonel Barker in this book has explained the principles which underlie the whole penal system, and the particular applications of them, which experience has so far proved to be useful in India, and has indicated lines of improvement which require further study. The book will therefore be of the utmost value to all serious students of social questions and not least to those devoted workers of the Discharged Prisoners' Aid Societies who are trying to secure by their educative methods the restoration of prisoners to a useful and respectable place in society."

In the first three chapters Col. Barker rapidly passes in review the beginnings of the English penal methods and the origin of the English prisons, the English prison system of to-day, and prison methods in the Continent of Europe. The most recent and notable advances in Great Britain have been the Probation Act of 1907 which enabled magistrates in certain cases to release offenders on probation, the introduction of Borstal institutions for juvenile criminals, the Mental Deficiency Act of 1913 which removed mentally defective persons from prison to mental hospitals, and the Criminal Justice Administration Act of 1914 which greatly reduced the prison population by allowing time for the payment of fines. One result of these measures has been to reduce the imprisoned population of Great Britain from 197,941 in 1904-5 to 56,028 in 1927. And from its savage beginnings under the early Henries and the Tudors—(when it was forbidden to torture under-trial prisoners, but when they might languish in jail for 7 years before trial or die of want or disease)—to its present and almost benign condition, Colonel Barker briefly traces the history of English prison administration. The comparison with present day conditions on the Continent is interesting; solitary confinement, abandoned in Great Britain, is still in force on the continent, and in Belgium a murderer may spend his first ten years in a solitary cell.

In chapter 5 the author next passes first to an account of the history of prisons in India. Leniency in the days of Muhammedan and Hindu Raj was exceptional; beheading, trampling to death by elephants, and various forms of mutilation were the stock punishments for even minor offences; under one ancient legal ordinance amputation of limbs was the proscribed penalty for certain offences. Prisons did not exist, but dungeons took their place. By 1836 however the East India Company had established 186 jails in its territory, containing 56,632 prisoners, many of them employed on road making. In 1787 transportation was commenced, the first penal settlement abroad being in Bencoolen in Sumatra, removed to Penang in 1823 when Sumatra was made over to the Dutch. Later Singapore and Malacca were established as penal settlements, to be broken up in 1873, and their convicts transferred to the Andamans, which dates as a penal settlement from 1867. With regard to jails in India the Committee of 1838 secured much needed reforms in building, but recorded that the Indian system was at least as much up to date as that in Great Britain, and had adopted many of the Howard reforms which had not yet been introduced in England. In the fifties of the last century notable improvements in construction were introduced, especially in Madras Presidency, and especially in the conversion of jails with enormous communal wards into cellular ones. The later recent

work of the Indian Jails Committee in 1919-20 will be well known to our readers. To a large extent, where finances permitted, their recommendations have been carried out. The Andamans are in course of conversion from a penal to a free settlement. Juvenile jails or modified Borstal institutions have been established in all provinces for the segregation of juvenile offenders, the "star" class of prisoners has been introduced, special jails have been set aside for habituals, advisory boards constituted to advise with regard to early release of prisoners, schools opened in jails, religious instructors appointed, the pay of the jail staff increased and methods of manufacture in factories improved.

Chapter 6 deals with the important subject of juvenile delinquency in India and its treatment. To pass Childrens' Acts is not enough; special machinery for the accommodation of juveniles is required. Remand homes, childrens' courts, and the appointment of probation officers are all essential. With regard to Borstal institutions for adolescents, most progress has been made in Madras Presidency and the Punjab. Here the essential features of training are physical drill, training in primary education under as attractive conditions as possible, an industrial training, and above all, a selected and suitable staff; in India the religious and moral instruction has to be left to priests and moulvies from outside and cannot be supervised by the jail superintendent. In chapter 7 the question is raised as to whether probation officers can be appointed in India; almost every Indian city with a population of 100,000 inhabitants could provide work for one such officer. In rural areas one could fall back upon village head men, tahsildars, and honorary magistrates. The Punjab Government passed a Good Conduct Prisoners' Probation Release Act in 1926, and appointed a special "Reclamation Officer" to supervise its working; one of his most important duties is to organise an after-care system for prisoners discharged on probation, another to pay special attention to the treatment of children and juvenile delinquents. In two years 990 prisoners had been released on probation under such supervision, and all but 6 had proved themselves worthy of the trust reposed in them.

The casual offender is dealt with in chapter 8. Here the most essential reform needed—(and one which is being carried out by degrees in the different provinces, as funds permit)—is the segregation of the casual offender from the habitual, for the latter usually acts as a virus, inoculating the former with the instinct for habitual crime. Primary education and vocational training should be especially emphasised in such segregated jails. The habitual or recidivist is a much more difficult problem, especially so in India, where many prisoners are members of criminal tribes. These prisoners should be housed in separate jails, sentences should be sufficiently long to act as a deterrent; transportation, and the formation of island and segregated agricultural colonies are measures advocated.

With regard to the female criminal, the special prison at Holloway, with an average population of 310 inmates, is a model of what a prison for such inmates should be. The Borstal institution at Aylesbury, with its training in domestic work, laundrying, music, and even picnics, is again an example of a model institution. In India the opening of special female jails has obvious advantages, since a properly equipped female hospital can be provided. The female jail at Port Blair was a hive of industry prior to its closure in 1920.

With regard to medical attendance the lot of the average Indian prisoner is a very happy one. New admissions are thoroughly overhauled, and in 1926 the annual death rate in Indian prisons was only 2.6 per thousand. Special jails for the mentally defective, for lepers, and for tuberculous prisoners are being constructed or have been opened in several provinces. The fact that 75 per cent. of jail prisoners in India gain in weight during their incarceration shows how well they are looked after.

Chapter 12 deals with points in jail management, and should be read in the original by all concerned with prison administration in this country. Chapter 13 gives

an outline of the present most unsatisfactory state of affairs with regard to the after-care of prisoners; the Prisoners' Aid Society of Madras being singled out as the one that is "by far the most efficient and successful." A brief concluding chapter summarises the improvements in prison administration which Colonel Barker considers necessary in India, and outlines the future policy which he considers should be followed in this country.

R. K.

**SURGICAL PATHOLOGY.**—By W. Boyd, M.D., M.R.C.P. (Ed.), Dpt. Psych., F.R.S. (Can.), Second Edition. Revised and Reset. Philadelphia & London: W. B. Saunders Company Ltd. 1929. Pp. 933 with 474 illustrations and 15 coloured plates. Price, 48s. net.

TEXTBOOKS on surgical pathology are usually written by surgeons and bear a close resemblance in their treatment of the subject to the traditional arrangement of textbooks of surgery. This book, the first edition of which appeared in 1925, is written by a pathologist and its keynote is expressed in the first sentence—"The surgery of to-day is based on pathology." As Dr. W. L. Mayo points out in his foreword, the pathology of the past generation was built up on knowledge acquired largely from the post-mortem room, whereas to-day it has become a science dealing with living things and conditions and furnishes a ground-work of knowledge which facilitates early diagnosis and cure by scientific methods.

The usual formal sketch of elementary bacteriology is in this edition replaced by a chapter headed "The Surgeon and the Laboratory," which deals briefly with the various conditions in which laboratory procedures may be of help in diagnosis and indicates the lines to be followed to utilise them to the fullest extent. The sections on inflammation, the inflammatory exudate, the tissue response and repair are well balanced discussions of the most modern views on cellular pathology. The problem of the wandering cells of the tissues is taken up again in an admirable section dealing with the reticulo-endothelial system, in connection with which the modern views on Hodgkin's disease and on lymphosarcoma are very clearly summarised. No artificial boundaries between medicine and surgery are recognised and the author has incorporated in the sections on the spleen all that the student need know about Banti's disease, hæmolytic jaundice and Gaucher's disease. Recent experimental work on cancer is reviewed and there is an interesting section on the effects of radiation on malignant growths, in which there occurs the only proof reader's error we have detected—on p. 169 the sentence beginning "eosinophils are often present" and the two following sentences are repeated lower down the pages. Broders' work on the grading of carcinoma, which has such an important bearing on treatment by radiation, is briefly reviewed.

The sections on the stomach and thyroid gland have been rewritten and are admirable, particularly the latter; no less than 36 pages are devoted to a summary of present day views on goitre; the author's view that toxic adenoma and exophthalmic goitre are manifestations of the same pathological process is an opinion which is steadily gaining ground even in the very centre where Plummer's classical researches were carried out. The sections on melanomata, tumours of the testicle and endometrial implants have all been rewritten to bring them into line with recent work by Dawson, Bell, Sampson and others. The section on malignant tumours of bone has been rewritten in the light of the information obtained from the American Registry on bone sarcoma, and the classification of brain tumours has been recast on the basis of Cushing and Bailey's work. A summary of Wilkie's work on the ætiology of chronic cholecystitis and of the recent criticisms of Sampson Handley's views on lymphatic permeation in carcinoma of the breast are included. It is surprising to find no mention of Hunner's work on interstitial cystitis, though his views on stricture at the lower end of the ureter are referred to.

This brief review will suffice to show that the book has been brought thoroughly up to date. Other works on surgical pathology written on such sound scientific lines may exist, but the reviewer has not met with them. The perusal of this book has been a great pleasure, its 900 pages are perhaps too much to expect students to grapple with and much of the subject matter is rather above their heads, but teachers of surgery will be well repaid for their trouble if they will read it and incorporate its main points in their lectures.

W. L. H.

**THE DOCTOR'S MISSION.**—By Dr. Erwin Lick. Translated by J. Ellis Barker. Pp. 276. London: John Murray. 1930. Price, 6s.

THIS is a most remarkable book. It was first published in German in Munich in the summer of 1926, it has been translated into other languages, whilst 30,000 copies of it have been sold in impoverished post-war Germany alone. However little love the medical profession have for Mr. Ellis Barker, we think that they will be grateful to him for a translation which is extremely readable and in good idiomatic English. The author is a well known surgeon, practising in Danzig, now of independent means, and his reflections, reminiscences, revelations, and above all criticisms and caustic comments on the professions of medicine, surgery, and gynaecology, combine in this volume to make a book which is highly controversial, in many places pungent, often epigrammatic, and yet delightful to read.

The introduction, 25 pages, is by the translator. Of these, the first 3 relate to Dr. Lick, and most of the remaining 22 to Mr. Ellis Barker. The latter is indeed so versatile an author that he has books to his credit on the problems of the British Empire, economic statesmanship, modern Germany, the reasons for America's economic success, chronic constipation, socialism, the causation and cure of cancer, and good health and happiness. In the course of so widely varied a journalistic career, Mr. Ellis Barker has discovered that patients are frequently operated on unnecessarily, that women suffer much at the hands of gynaecologists, that correct dietary is important in the cure and control of malignant disease, that doctors drug too much, and that auto-intoxication is a terrible reality; in brief that Mr. Ellis Barker has not infrequently cured patients whom the medical, surgical, and gynaecological professions have either given up or maltreated. "Any stick is good enough to beat a dog with," to quote the old adage. Yet we can forgive Mr. Barker for what follows. If he would take out a medical degree, however, we feel sure that his results would be even better.

Dr. Lick commences with his medical student days. We fear that it is true that medical students are too often ribald or profane where they should be silent and reverent, that there is not a sufficiently holy atmosphere about the dissecting room; yet, despite the rowdiness of youth, we believe that few students take up medicine as a career without imbibing some of its high ideals.

Chapters follow on the bedside teaching of medicine—in which the author deplores the want of attention to *treatment*, and the insistence on accurate diagnosis and prognosis; and on medical practice in general. This last chapter contains a thoroughly readable account of the difficulties and sorrows of a *locum tenens*; the realities of general practice are far different from the sequestered wards of a big hospital; the medical student should first be taught how to nurse a patient; he should acquire such knowledge as how to give an enema, to make a poultice—very sound doctrine, but if the medical student has to face a training in nursing as well as the rest of his present curriculum, he will be hard put to it. The general practitioner, as it is, acquires his nursing and emergency experience after he has qualified, and not previously.

Chapter V deals with physician and patient. Here there is rightly emphasized the lesson that the doctor is not merely called upon to treat a disease, but a sick person. Is an operation for appendicitis to be undertaken on his wife, asks the husband, because she is suffering from that disease, or because of the fee attached to the operation? And here we get the first introduction to the author's main thesis, that a physician is one who tries to heal disease, whereas a medical practitioner is one who is trying to make a livelihood; it is developed fully in the pages that follow. The author is in favour of not telling the patient the worst; "my incurable cases have lost their lives," he quotes from Reil, "but they have never lost hope."

Chapters VI to VIII deal with one of the major subjects considered in the book—the exploitation of the medical profession by schemes of compulsory insurance for the working classes of all grades. Here the author is violently antagonistic to compulsory State insurance; it debases patient and doctor alike, the former into a work-shy malingerer, the latter into a slave. Under such conditions the doctor deteriorates into a "pill-slinger." And here chapter and verse and many quotations from medical and lay papers emphasize the evil that compulsory State insurance inflicts. (In brief the author presents very forcibly one side of the case; it has another, that it improves the financial status of the doctor, and the health of the worker. The whole question, however, is so controversial that here we cannot deal with it. Dr. Lick's case is for the prosecution, and it is most ably set forth. Post-war Germany, he writes, has organized an independent medical profession almost out of existence.)

The author next proceeds to set forth the case against the operating surgeon and gynaecologist; "a medical man who knows that one of his patients has £200 to spare would be an idiot if he did not cut out his appendix" he quotes from an English comedy. "Similar things happen all over the world." The floating kidney hardly exists in real life, but it is a financial asset of great value to surgeons; malpositions of the uterus may be unimportant and may tend to correct themselves, but they present a gold mine to the enterprising gynaecologist. A doctor who possesses an x-ray apparatus has to use it, no matter what the patient is suffering from. "In the world of surgery," writes the author, "we find again and again an incredible shallowness of thought." Sick children often recover after removal of a perfectly healthy appendix. Exploratory laparotomies, unaccompanied by any other measure, often cure severe abdominal diseases. "Surgery is becoming a soulless, unintelligent handicraft, and the art of healing, as practised by the physicians, is coming more to the fore," he writes. We may safely leave it to the surgeons to reply.

The "modern pursuit of science" is next dealt with. Here we are in thorough sympathy with the author in his complaint of the immense and unnecessary volume of immaterial, unimportant articles published. Specialists come next for candid criticism. "The great surgeon Hyrtl condemned in fiery language the right of surgeons to kill with impunity. The great Sprengel similarly condemned the castration mania." The anatomist may discover oöphoritis, endometritis, etc.,.....but the physician will discover unhappy marriage, impotence, childlessness. The soil in which disease is implanted has been too long neglected; also the influences of heredity.

Next comes a section on quackery. Here the author is at least broad minded; we owe digitalis to the stories of an old peasant woman, quinine to savage races of South America; of the great American nation he writes "one man hopes to maintain his health with physical jerks, another swallows pills, a third uses a subcutaneous syringe..... The highest development of the health amulet mania I found in the most enlightened of countries, in the United

States, in the form of an incredible number of health foods, patent medicines, health exercises, etc." And he concludes that patent medicines may be of use as a panacea to those who are not sick and in need of a physician, but when the proprietors of such nostrums themselves are ill, they immediately flee themselves to an orthodox physician. (In this chapter the author's point of view is completely at variance with that of the translator. He will admit that the quack may achieve discovery, but that is in spite of, rather than due to, his ignorance.) He admires Coué, but personally would go elsewhere for psychical treatment. Having read a book on *How to Sleep Well* he suffered from insomnia, a condition which had not previously affected him. But he is in general tolerant; a smoky candle is better than none. Finally comes a concluding chapter which again sharply differentiates the true physician from the (commercial) medical practitioner.

It is not easy to review this book. Candid criticism, however, is no bad thing. That the author omits all mention of the obverse side of the picture is unfortunately true. Had he read Sir William Osler's addresses to medical students and collected essays, he might have recognized more of the good and less of the bad side of medical practice. In spite of this, we would heartily recommend the book to our readers. It is always well "to see ourselves as others see us."

R. K.

**CLINICAL LABORATORY METHODS.**—By R. L. Hadden, M.A., M.D. Third Edition. Pp. 317, with 69 illustrations and 4 colour plates. St. Louis: The C. V. Mosby Company. 1929. Price, \$ 5.00.

THIS, the third, edition of this useful little book on clinical methods has maintained the high standard set by its predecessors. It is essentially a handbook and not a treatise; as a general rule one method only is described, though occasionally a second, which the author thinks might be useful under different circumstances, is given. The descriptions of technique are clear and concise. There are a number of text illustrations which are helpful, and more discretion has been shown in their selection than is frequently the case in books of this nature. To this general remark there are, in the opinion of the reviewer, a few exceptions; the machine for shaking blood-counting pipettes, shown in figure 33, is doubtless very useful, but is a luxury which the private practitioner or the small laboratory could scarcely afford, and the space devoted to its illustration might have been employed more usefully. The four coloured plates are both well-executed and helpful; the tropical worker would have appreciated a fifth plate showing malarial parasites. The description of malarial parasites, though unillustrated, is useful and, on the whole, accurate; in Table XVI, however, the type-setter (we hope) has given a little free play to his imagination and has added to the difficulties of the student by giving "quartan" as the synonym of *P. falciparum*, and in describing the gametocytes of all three parasites, including the last-named, as spherical.

The book is well printed on excellent paper, and is strongly and suitably bound.

L. E. N.

## Annual Reports.

KING EDWARD VII MEMORIAL PASTEUR INSTITUTE AND MEDICAL RESEARCH INSTITUTE, SHILLONG. TWELFTH ANNUAL REPORT; FOR THE YEAR 1928. BY LIEUT.-COL. J. MORISON, I.M.S., DIRECTOR. SHILLONG, ASSAM GOVT. PRESS. PRICE, RE. 1-1-0.

THE year 1928 saw the commencement of a policy of decentralisation of antirabic treatment in Assam, the



vaccine being sent to out-centres where patients were treated. Thus whereas in 1927 the number of patients treated at Shillong was 1,142, in 1928 the number treated at Shillong was 958 and at out-centres 75. No less than 99 per cent. of patients were followed up by the usual system; 2 died within 15 days of completing treatment, and 5 more than 15 days after; total hydrophobia rate 0.7 per cent., failure rate 0.5 per cent. (Considering the large proportion of cases of jackal bite at Shillong, these figures must be considered as very satisfactory.) In the case of 15 persons, all severely bitten by animals which had been proved to be rabid, the ordinary treatment was given on alternate days, and on the other days 2 c.c. of the 1 per cent. carbolised virus intravenously. These 15 cases were of the most severe type and believed to be at grave risk. Only 1 of the 15 died of hydrophobia.

As 1928 saw the introduction of the policy of decentralisation and the issue of vaccine to out-centres, Col. Morison takes the opportunity in the report under review to summarise the antirabic work at Shillong from 1917 to 1928. The tables for these 12 years deal with 16,155 patients, and are contrasted with the 20,500 cases collected in Kasauli by Col. MacKendrick for the quinquennium ending 1915. Shillong has a definitely lower mortality than the sister institute at Kasauli. There were no deaths from hydrophobia amongst the 969 European patients treated, and the figures given refer only to Indians, who, as is well known, are at much more risk, since almost all of them have been bitten, and frequently severely bitten.

The figures for seasonal incidence show but slight variation, though the mortality from hydrophobia is slightly higher during the monsoon period than at other times of the year. The ratio of jackal: dog bites was 0.25 at Shillong and 0.24 at Kasauli. The mortality caused by rabid jackals was 1.73 as against a mortality rate of 0.65 per cent. from dog bite at Shillong; the corresponding figures for Kasauli being 2.02 and 1.11 respectively. Only 1 death occurred among the "lick" cases; this was due to saliva of a human being with hydrophobia coming into contact with fresh cuts or abrasions.

The mortality bears a very definite relationship to the number of tooth marks. Thus for 1 tooth mark it was 0.04 per cent., for 9 tooth marks 3.91 per cent., and for 10 tooth marks 3.89 per cent., for more than 10 tooth marks 3.25 per cent.; these figures run parallel to the Kasauli ones, but are at a definitely lower level. With regard to lateness of arrival—a point which was much stressed by Col. MacKendrick—the Shillong figures for 1927 and 1928 show that there were no deaths among 163 cases treated within 48 hours of being bitten, and 3 deaths among 216 cases treated on the third day or later. Every attempt should be made, therefore, to treat all cases within 48 hours of the bite. Deep wounds—7,189 cases—gave a mortality rate of 1.71 per cent., superficial wounds—8,966 cases—a rate of 0.27 per cent. Among 13,967 patients bitten on bare skin the mortality rate was 1.01 per cent., as against a rate of 0.27 per cent. among 2,188 persons bitten through clothing. With regard to the effect of cauterisation within two hours of the bite, the mortality was 0.82 per cent. among the cauterised cases, as against 1.09 per cent. among the uncauterised cases.

(The summary tables for 1917 to 1928 in this report will be specially useful for comparative purposes. The Indian institutes have now so immense a volume of collected and detailed statistics with regard to antirabic treatment with carbolised vaccine that it would be almost worth while to have it all put together and analysed by someone with expert knowledge. No other country in the world can furnish so large a volume of detailed statistics on this matter.)

The report mentions several improvements at the Shillong institute. A steam boiler and a large Velox steam steriliser have been installed. A large electrically heated and automatically regulated incubating room has been constructed—this being probably the first of its kind in India. The institute has now both an

electric supply from the town current, and also its own direct current plant.

Doses of cholera vaccine issued totalled 237,773, of which more than one half were prepared at the institute; 4,338 doses of typhoid vaccine were issued; and 21,220 doses of influenza vaccine, purchased from the Central Research Institute, Kasauli. A special study of the manufacture and use of bacteriophage in connection with cholera and bacillary dysentery was carried out during the year; (this has already been reviewed in our columns previously). The following figures may be quoted from the report, however:—

<i>Cases treated with bacteriophage.</i>	<i>Cases.</i>	<i>Deaths.</i>
Acute dysentery ..	396	17
Chronic dysentery ..	44	1
Choleraic diarrhoea ..	17	3
Cholera (treated with 'phage) ..	80	24—30%
Cholera (treated without 'phage)	92	50—54%

Bacteriophage is now being used very extensively throughout the whole of Assam in the treatment of bacillary dysentery and cholera; the 'phage issued is a polyvalent one, and is issued at a price of one anna per dose; the monthly demand from the Province is now approximately 36,000 doses or more. The results in cholera appear to be at least as good as those with hypertonic saline, for the above figures include two cases who were moribund and died within six hours of receiving their first dose of 'phage.

Several papers were contributed to the *Indian Journal of Medical Research* and the *Indian Medical Gazette*, and others read at the annual meeting of the Assam Branch of the British Medical Association. In conclusion, Col. Morison comments on the excellent work done by Military Assistant Surgeon A. C. Vardon, C.P.H. (Harvard), I.M.D., Assistant to the Director.

#### THE PASTEUR INSTITUTE OF SOUTHERN INDIA, COONOR. ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR ENDING 28TH FEBRUARY, 1929.

This report, by Capt. K. R. K. Iyengar, M.D., D.P.H., I.M.S., the Director, presents certain new features, for the schedule outlined by the International Rabies Conference held in Paris in April 1927 has been adopted, and the statistical tables modified in accordance with it. The report is in two parts; the first dealing with patients treated at Coonor, the second with those treated outside Coonor with vaccine sent from Coonor to local centres.

The total number of patients treated at Coonor was 465, an increase of 71 on the figures for 1927-28, chiefly due to a high incidence of rabies among dogs and jackals in the Nilgiris District. Advice, but no treatment, was given to 155 other persons. The dosage for all patients is the same (5 c.c. daily of a 1 per cent. emulsion of fixed virus in carbolised saline daily for 14 days; the vaccine having been allowed to mature for at least a fortnight in the refrigerator before it is brought into use. In this we believe that the Director is right, for a policy of intensive treatment, prolonged treatment, etc., is apt to lead to neuro-paralytic accidents).

Of the 465 persons who received a full course of treatment, it was ascertained six months later that 409 were alive and well. Four died of hydrophobia, three of them more than 15 days after completing treatment; the total hydrophobia rate was 0.64 per cent., and the failure rate 0.43. No neuro-paralytic accidents were recorded during the year.

Turning to Part II, 4,686 patients received a full course of treatment with the vaccine provided by the Institute at outside centres. Another 461 commenced, but did not complete treatment. Ninety-eight per cent. of patients who received a full course of treatment were followed up six months after completing treatment (a very creditable figure, which shows that such patients can be followed up if sufficient pains be taken).



Of those who completed treatment, 8 died from hydrophobia during treatment, 14 within 15 days of completing treatment, and 39 more than 15 days after the completion of treatment; in addition there were 4 deaths from hydrophobia among incompletely treated patients. The total hydrophobia rate was 1.13 per cent., and the failure rate 0.55 per cent. The statistical tables show the usual features for such mortality, that bites on bare skin are more dangerous than those through clothing, the importance of cauterisation, etc. (It is rather a pity that in reports such as these an enormous amount of statistical information with regard to such information is collected and recorded in a standard and uniform manner; but the information so laboriously collected in the tables is not discussed in the text.)

Four new antirabic treatment centres were opened during the year, at Kodaikanal, Sandur, Singareni Collieries, and Bhadrachalam respectively. No neuro-paralytic accidents were reported among patients treated at out-centres during the year, but it is to be noted that the failure rate (although minimal) was definitely higher in patients treated at out-centres than in those treated at Coonoor. Tables XIII in Parts I and II of the report give the usual full details with regard to all deaths from hydrophobia.

In Part II of the report the annual number of deaths from rabies (presumably hydrophobia in man) recorded in the Madras Presidency year by year from 1913 to 1928 is given. This table shows a steadily rising number from 26 deaths in 1916 to 564 in 1928; but the last year shows a drop from the figure of 636 recorded for 1927. Whereas, during these sixteen years, 3,703 deaths have occurred from hydrophobia among an unknown number of persons bitten by rabid animals but not treated; among 38,477 persons similarly bitten but treated, the total number of deaths from hydrophobia was 406.

(In this section we miss the usual annual table showing the relative death rates among treated and untreated classified according to the ascertained rabidity of the animal which bit. The Coonoor Institute has carried out most useful work in collecting these figures for several years, and an analysis of the final results would be of interest. As, however, the special Rabies Sub-Committee of the all-India Annual Conference of Medical Research Workers in December 1929 has recommended the pooling of all statistics from all Indian Pasteur institutes, we may look forward to a careful analysis of these and similar problems on a large scale. The various Indian institutes—adopting a more or less uniform treatment, and collecting statistics in a uniform manner—are in a position to analyse a mass of figures with regard to results of treatment, degrees of risk, etc., which no other country in the world can compete with.)

The report is full of the usual detailed statistical tables, drawn up in a uniform manner. On pp. 36 and 37 are detailed the items of information with regard to each patient which, it is suggested by the International Rabies Conference of 1927, should be collected on uniform lines in all countries. The suggested standard individual case history sheet is given on p. 39.

With regard to finances the receipts totalled Rs. 1,10,352 and expenditure Rs. 83,581—including a sum of Rs. 25,000 transferred to capital funds. Pages 29 to 32 show how liberally the institute is supported by commercial industries, district and municipal boards, etc., in the Madras Presidency; but, although many patients from outside Madras Presidency are treated, there is little support from outside the Presidency (and local Indian States) financially.

Four scientific papers dealing with the results of research work carried out in the Institute were published during the year in the *Indian Journal of Medical Research*.

An appendix to the report gives the rules adopted by the International Rabies Conference with regard to the collection of statistical information in a uniform manner. A standardised form is also given for reporting the state of the patient's health six months after the expiry of treatment, this forming part of the new standardised individual case history sheet.

# FIFTY-FOURTH ANNUAL REPORT OF THE CHEMICAL EXAMINER'S DEPARTMENT, BENGAL, FOR THE YEAR 1928. BY LIEUT.-COL. T. C. BOYD, I.M.S. CALCUTTA, BENGAL SECRETARIAT BOOK DEPOT. PRICE, RE. 1-2-0.

The tremendous annual increase in the work of this Department is shown by the fact that the total number of articles examined has risen steadily from 3,141 in 1921 to 8,876 in 1928, each year seeing a progressive increase.

A good deal of special work was carried out during the year. Mr. D. N. Mukherjee, Superintendent of Excise and Salt, Birbhum, carried out an investigation on the use of *bakhar* in the preparation of *pachwai* in May and June, and submitted a report to Government. The analysis of excisable drugs, taken over in 1927 from the Excise Department, was continued during the year, and 1,807 articles examined, an increase of 822 on the figure for 1927. A committee was appointed during the year to consider the reorganisation of the Department, in view of the great increase in its volume of work. Col. Boyd delivered the lectures in organic and inorganic chemistry at the Calcutta Medical College, and 299 students attended the classes and lectures during the year.

Research work was carried out under the auspices of the Indian Research Fund Association in connection with the estimation of antimony in the urine of patients under treatment for kala-azar; also into the chemical peculiarities of fat occurring in cases of chyluria. Of curious cases in which expert opinion was asked for mention is made of opinion sought as to whether certain nitrocellulose paints should be classified under the heading dangerous petroleum; the presence of aldehydes and peroxides in samples of ether; the detection of snake venom in viscera; and the examination of samples of liquor adrenalin hydrochloridi, B.P.

In the General Department (including Excise) 3,381 examinations were carried out. These included examination of samples of cocaine, opium, opium preparations, *bhang*, *charas*, and *bakhar*. Of 10 samples of mustard oil tested, only 1 was found to conform to the standards required under the Food Adulteration Act. Samples of explosive substances examined numbered 199, and articles in connection with counterfeit cases and forging 53; also 63 examinations were called for in connection with the Medical Store Depot, Calcutta.

In the Medico-Legal Department 2,412 cases were referred for opinion, specimens being submitted from Bengal, Bihar and Orissa, Assam, the Government of India, and Indian States. The total number of articles examined was 5,495, an increase of 996 on the figure for the previous year. Stain cases numbered 975 with 2,667 articles examined. In connection with human poisoning 836 specimens of human viscera were examined, including 13 in connection with abortion cases; poison was detected in 156; it is doubtful whether any other chemical examiner's department in the world has such a large number of viscera cases to deal with annually. As usual opium and morphine were the two poisons most commonly encountered, then arsenic, oleander, alcohol, and aconite. In the majority of cases sent for analysis the medical officers withheld their opinion as to the cause of death. Very frequently no history of the case is sent with the specimens submitted, and, as the poisons which may be employed are numerous, and the material available for analysis limited, this leads to great difficulties. A still more important point is that often no details are given as to whether any treatment has been given; thus in opium poisoning it is of the utmost importance to know whether potassium permanganate has been administered by the stomach tube. Further, it is not realised that it is important to collect and send for analysis any urine present in the bladder; in many cases alkaloids can be detected in the urine unchanged, and this often helps to determine the diagnosis.

In addition to the specimens of viscera mentioned above, 113 specimens of human tissues were sent for

examination for poisons, chiefly from the Police Surgeon, Calcutta, of tissues other than the stomach. There was also a large number of specimens of vomited matter and other excreta.

With regard to animal poisoning the viscera of 167 horned cattle were received for examination, and 28 specimens of vomited matter or other excreta. The poison chiefly used was white arsenic, much more rarely oleander and aconite.

The number of articles received in connection with 975 stain cases was 2,667. Human blood was detected by the Imperial Serologist in 1,057 articles out of 2,122 examined; 31 articles proved to be stained with non-human blood; and in 226 articles the presence of blood was proved, but its origin could not be determined. In 808 articles no blood could be detected. In connection with 161 articles from rape cases, 137 articles showed human blood, 2 showed non-mammalian blood, and 1 showed bird's blood. Other miscellaneous articles received for identification and opinion were bones, hair, teeth, etc.

*Medico-legal Notes.*—The following cases of medico-legal interest are abstracted from the report:—

*Poisoning by oleander to procure abortion.*—Viscera of a Hindu female (widow), aged about 25 years, were forwarded by the medical officer of Puri with the history that the deceased was alleged to be pregnant and took something to procure abortion. On post-mortem examination the mucous membrane of the stomach was found congested—the uterus was found enlarged (6" × 3") and contained reddish black coagula. The medical officer could not give any definite opinion as to the cause of death. Oleander was detected in the viscera.

*Arsenic used as infanticide.*—Viscera of a female child, aged about 9 months, were forwarded by the Assistant Surgeon of Barh (Patna) with the history that the deceased child was said to have been throttled to death by a man who forcibly took the child from her mother. On post-mortem examination the stomach wall was found congested in patches, intestines were also found congested and contained whitish fluid faeces. No sign of ecchymosis under the skin of the neck was present. The medical officer could not give any definite opinion as to the cause of death. Arsenic was detected in the viscera.

*Arsenic in a floating body.*—Viscera of an unknown Hindu male were forwarded by the Civil Surgeon of Burdwan with the history that the body of the deceased was found floating in the Ranisagar tank. On post-mortem examination the mucous membrane of the stomach and intestine was found congested. The medical officer could give no definite opinion as to the cause of death. Arsenic was found in the viscera.

*Atropine in a floating body.*—Viscera of an unknown male boy aged about 4 years, were forwarded by the Civil Surgeon of Sambalpur with the history that the body was found floating in the Mahanadi river. Post-mortem examination did not reveal any signs of death by drowning, and the medical officer could not give any definite opinion as to the cause of death. Atropine was detected in the viscera.

The Assistant Surgeon of Jajpur (Cuttack) forwarded the viscera of a Hindu male, aged about 22 years, a fisherman by caste, with the history that the dead body was found in a house, and gave his opinion that death was due to hyperpyrexia. Post-mortem report showed that most of the internal organs were more or less congested, membranes, brain substance and ventricles were congested and the pupils were slightly dilated. Opium was detected in the viscera.

*Drugging by atropine.*—The Medical Officer, Police Hospital, Barrackpore, forwarded the stomach washings of two men with the history that the men came to Calcutta to make some purchases for starting a business. They met two friends who took them to a house and gave them bread to eat. Soon after taking the bread they became unconscious and incidentally were robbed of all the money they possessed. Subsequently they were taken to the Naihati police-station

by their relatives and from there they were removed to hospital on 4th November 1928 at 9 p.m., where the medical officer observed the following symptoms. They were drowsy, speech incoherent, could not respond to questions. Pulse good, respiration easy, no temperature, tongue moist, pupils widely dilated. Their stomachs were washed and they were kept under observation for a day and then discharged. Atropine was detected in the contents of the stomach washings.

*Oleander in case of hanging.*—The Medical Officer of Sunamganj (Sylhet) forwarded the viscera of a Hindu male, aged 10 years, with no history, but gave his opinion from the post-mortem examination that death might have been due to hanging. Post-mortem signs were one oblique non-continuous mark between chin and larynx 7½" long, ½" broad. On dissection, tissues underneath were dry and hard. Rigor mortis in lower extremities, eyelids closed, pupils equally dilated, tongue bitten and partly protruded between teeth. Lungs, liver and kidneys congested. Mucous membrane of stomach and coats of intestine congested. Oleander was detected in the viscera.

*Aconite in an alleged case of snake-bite.*—The viscera of a female child of 3 years sent by the Assistant Surgeon of Araria (Purnea). The father of the deceased reported at the police-station that the child died of snake-bite. It transpired however that some sweet-meats (*laddo*) were given to the child in the morning. The internal organs were slightly congested. Aconite was detected in the viscera.

*Strychnine, arsenic and alcohol in an injury case.*—The viscera of a Hindu male, aged 30 years, forwarded by the Assistant Surgeon of Burdwan, no history, one lacerated wound 1½" × 1" scalp deep above right temple. Stomach slightly congested with smell of alcohol. The medical officer gave no opinion as to the cause of death. Strychnine, arsenic and alcohol were detected in the viscera.

The Sub-Divisional Officer of Karimganj (Sylhet) forwarded to this office in connection with a case under section 376, I.P.C., a piece of rag with blood stains. History of the case was that one Inus Mia lodged a complaint that his niece, aged about 10 years, was forcibly ravished by one Syed Ali, a neighbour of his. The piece of rag was on the person of the outraged girl at the time of the occurrence. It was found blood-stained. On examination the rag was found by the Imperial Serologist to have been stained with the blood of a bird (probably fowl).

The Sub-Divisional Magistrate, Kishoreganj (Mymensingh), forwarded to this office for examination and report in connection with a case under section 376/366, I.P.C., a piece of cloth. The history was that the alleged victim was ravished by five accused persons. On analysis, no spermatozoa could be detected and the brownish stains on the cloth were found to have been stained with the blood of a bird (probably fowl) by the Imperial Serologist.

*Staff.*—During the year Rai Dr. Hiralal Sinha Bahadur, First Assistant Chemical Examiner, retired from Government service; he has rendered many years of able service and his loss will be felt in the department. Dr. Satyendranath Sen, Second Assistant Chemical Examiner, also retired. Mr. Purendunath Mukherjee, B.Sc., was appointed as a probationer in the department in May 1928. Two temporary appointments were created to deal with the new teaching arrangements, and Mr. B. K. Bose, M.Sc., and Mr. H. Ganguli, M.Sc., appointed to them.

Colonel Boyd's report shows, as usual, how the work in his Department grows rapidly in volume year by year, and the necessity for increased staff to cope with rapidly growing demands.

ANNUAL REPORT OF THE CHEMICAL EXAMINER TO THE GOVERNMENT OF MADRAS FOR THE YEAR 1928. GOVT. OF MADRAS, LOCAL SELF-GOVERNMENT G. O. NO. 1130 P.H., OF DATE 30TH APRIL, 1929.

MAJOR CLIVE NEWCOMB, I.M.S., held charge of the department until March 20th, 1928, when his services

were placed at the disposal of the Indian Research Fund Association for special duty in connection with Col. McCarrison's enquiry into deficiency diseases at the Pasteur Institute, Coonoor. Khan Bahadur Muhammad Aziz-ul-Sahib, B.A., M.B., C.M., then acted as Chemical Examiner for the rest of the year, and Dr. S. Rajagopal Nayudu as First Assistant Chemical Examiner. Three students underwent special training in the department during the year.

A table shows the steady increase in the work of the department from a total of 4,125 articles in connection with 1,311 cases in 1924, to 6,076 articles in connection with 2,110 cases in 1928. The routine work is so heavy and severe that but little time is left for research work or independent investigation. The Khan Bahadur points out that until some scheme is introduced for training suitable candidates to act as a reserve for future vacancies, leave will be almost impossible to obtain, and the strain on the existing staff is very severe; the Second Assistant Chemical Examiner has not been able to take leave since 1914.

Poison was detected in 126 out of 286 cases of suspected human poisoning. Mercury, opium, and arsenic head the list. The following cases abstracted from the report are of interest in this connection:—

Evidence in a case attributed death to sunstroke, but it was rumoured that the victim might have been poisoned by his first wife. Arsenic was found in the viscera.

A woman aged 17 years was stated to have died of cholera. Arsenic was detected in the stomach.

A man and his wife went to the forest for daily work leaving their six year old girl in the hut. This girl ate some paste which had been left in the hut and gave some of it to her playmate aged five years. This paste was intended to kill stray dogs. Both the girls died and arsenic was detected in their viscera.

A medicine said to make one subservient to the will of the one who administers it, was analysed and found to contain mercury in an insoluble form.

Within ten minutes after drinking coffee a man had a bitter taste and burning sensation of the mouth, throat and stomach, vomited, and passed blood in the motions. He had cramps of the legs and severe prostration. He recovered under treatment. The vomited matter and the motion passed in hospital were found to contain mercury.

In a case where death was suspected to be due to drunkenness, opium was detected in the stomach. In another case wherein death was attributed to suicidal hanging and the woman was stated to have lived for an hour after removal of the string, opium was detected in the stomach.

In one case a man took dhatura seeds mixed with jaggery to commit suicide. He died. A mydriatic alkaloid was detected in the stomach and contents and in the urine. (This case is of interest as dhatura is rarely taken with suicidal intent, but is more often used by criminals to render their victims unconscious.)

In another case a man was suspected to have been murdered and hanged. The body was decomposed. Apart from the mark of the rope there was no injury to the underlying tissues in the neck. A mydriatic alkaloid was detected in the stomach and contents:

A woman was suffering from stomachache and took nux vomica bark. Strychnine and brucine were detected in the stomach and contents. In another case six persons, four children and two adults, took a purgative prepared from a bark. The four children died and the two adults recovered with difficulty. The bark was found to contain strychnine and brucine.

A quack applied a liquid to the syphilitic patches of his patient and caused severe injuries. The liquid was examined and found to be concentrated commercial sulphuric acid.

A man and a woman were travelling together in a train. The man got down at a station and brought some "iddili" and coffee to the woman. They were both subsequently found unconscious. The medical officer washed out their stomachs and they recovered.

Chloral was detected in their stomach washings and also in the bottle found under the waist cloth of the woman.

A man aged 30 was suspected to have died of poisoning. The mucous membrane of the stomach was found corroded and leathery, and the stomach contents were stated to "emit a peculiar odour." The stomach and contents contained a cyanide.

A goldsmith boy aged 15 was brought to hospital in a dying condition. The wiped regurgitant matter was sent to the Laboratory along with the viscera. Cyanide was detected in the wipings of the regurgitant matter and also in the stomach and contents.

A man bought a meal from a hotel and ate some of it. His wife took a part of what was left, vomited, and died. The remainder was thrown into the street. A goat and a dog partook of it. The goat died and the dog had a narrow escape. The stomach and its contents of the woman were found to contain cyanide.

Poison was detected in 22 out of 53 cases of suspected animal poisoning; the poisons most commonly employed being arsenic and yellow oleander. A fatal epidemic among a pack of hounds was suspected to be due to poisoning, but bacteriological examination showed the presence of *Leptospira interrogans* (thus proving that icterohæmorrhagic : : : logs in India, just as is known to be the case in England. The infection is probably acquired from bathing in infected waters).

Stain cases numbered 656, with 2,839 articles. The number of specimens sent to the Imperial Serologist was 1,960, including 2 bones; human blood was detected in 1,847. Miscellaneous medico-legal examinations numbered 93 articles examined from 31 cases, and included 4 cases referred under the Explosives' Act. In the General Department the total number of analyses was 1,084 as against 755 in the previous year. Chinese crackers, received from the Commissioner of Police, Madras, were found to contain an explosive mixture of gunpowder and potassium chlorate.

Sir Norman Walker having recommended that forensic medicine should be taught by demonstrations of specimens of stained fibres, blood stains, seminal stains, poisons, etc., the teaching of this portion of the course in forensic medicine was taken over by the Chemical Examiner as an additional duty with effect from November 1928.

In common with the reports of every other Chemical Examiner in India, Khan Bahadur Aziz-ul-Jah's report for 1928 shows a state of affairs of continually increasing volume of work, and a severe strain placed upon a limited staff.

#### ANNUAL REPORT OF THE UNION MISSION TUBERCULOSIS SANATORIUM, AROGYAVARAM, MADANAPALLE, SOUTH INDIA, FOR 1928-29.

THIS report by Dr. C. Frimodt-Møller, M.B., Ch.B., the Medical Superintendent, is illustrated by excellent photographs showing the types of wards in use; as usual it tells a story of constant progress and most valuable work.

There are now 192 beds available, including two semi-general wards, and special wards for one or two patients. Ten new beds were added during the year, but the present accommodation is quite inadequate for the demands upon it, and there is a long waiting list. During the year 341 patients were admitted, the daily average number of patients in the Sanatorium being 183.9. All classes and races are admitted, and the table on p. 9 shows that persons in every rank of life and of every occupation come for treatment; the largest number are students—71 out of 331; and the age period chiefly concerned is from 16 to 30 years of age.

Of 254 cases admitted, 19.5 per cent. were in stage I, 20 per cent. in stage II, and 60.5 per cent. in stage III. The very large proportion of severe and late cases admitted should be borne in mind when comparing results at Arogyavaram with those in Europe. Of these

251 cases, 65 were discharged as "arrested," 88 as much improved, and 22 as improved. Of cases in stages I and II no less than 96 per cent. were cured or improved; of 151 cases in stage III only 51.3 per cent. The more detailed figures are:—

	Percentages.		
	Arrested.	Much improved.	Improved.
Stage I	.. 89.8	8.2	2.0
Stage II	.. 39.2	47.0	5.8
Stage III	.. 0.6	39.0	11.7

These figures emphasize in the most striking way the very great importance of sending patients for treatment as early as possible. The loss of tubercle bacilli from the sputum in discharged patients was 100 per cent. in stage I cases; 68.2 per cent. in stage II cases; and 36.2 per cent. in stage III cases. Fever took approximately 118.2 days to disappear, and, as a rule, patients are not admitted for less than three months' treatment. Artificial pneumothorax was tried in 88 cases; in 17 it was not possible to collapse the lung owing to adhesions, but of the remaining 71 cases 42 were discharged with "positive" results. Sanoerysin was tried in 23 out of the 254 cases, tuberculin B.E. in 8 cases, and autogenous vaccines in 14. There were 57 operations for phrenic-exsaisis, and a good deal of other general surgical work, especially tonsillectomy.

A table of complications shows the importance of co-existing diseases in pulmonary tuberculosis in this country; helminthic infections and syphilis rank very high, also nephritis, malaria, and chronic tonsillitis. The laboratory, under Mr. R. M. Barton, M.A., was called upon to carry out a very large volume of routine examinations, and trained 6 special assistants during the year. Two medical men were trained at the Sanatorium during the year, and the usual clinical classes of instruction were given to senior medical students from the Missionary Medical School for women at Vellore. Very numerous lectures were given by the staff in India, also by Dr. Frimodt-Møller in Europe when on furlough. A considerable number of papers were contributed to the medical journals. The medical library at the Sanatorium received a valuable gift of a tuberculosis library, originally costing about Rs. 6,000, from Dr. P. S. Chandra Sekar Ayer, Retired Director of the Tuberculosis Institute in Madras. Special attention is drawn in the report to the valuable work of Dr. R. H. H. Goheen as acting Medical Superintendent during part of the year whilst Dr. Frimodt-Møller was on furlough. Financially, the year cost Rs. 1,16,722, of which sum Rs. 72,693 was collected locally from payments by patients, hospital receipts, etc.

The report closes with a copy of the rules for admission, which medical men throughout India would do well to ask for and study before sending patients to Arogyavaram.

#### KASHMIR MEDICAL MISSION OF THE CHURCH MISSIONARY SOCIETY. REPORT FOR 1929.

THIS report, by Dr. Ernest F. Neve, M.D., C.M., F.R.C.S. (Ed.), illustrated by charming photographs of the hospital and of local scenery, differs from ordinary and routine annual reports in its interesting general presentation of the work carried out and the methods adopted. An account is given of a day in the hospital; in the morning as many as 150 in-patients may have to be attended to, coming from perhaps as many as 100 villages. By noon the out-patient department is in full swing, some 200 to 300 cases being seen; the two operating theatres are in full activity, and may have 7 or 8 major and over 40 minor operations to carry out. During the year the number of new out-patients totalled 24,719; in-patients 2,071—chiefly surgical cases, and laboratory investigations 2,240.

Dr. Neve comments on a subject which has long been of importance in India—the need for the co-ordination of medical relief. In Kashmir it is noted that the Medical Department, under Col. Hugo, I.M.S., has

adopted in general the policy of financial grants to efficiently run voluntary and missionary institutions; "the improvement in the medical service in Kashmir during the past two decades has been notable" we read, and a list of important voluntary hospitals whose work is extending is given. Major-General Sir T. H. Symons, recently D.G.I.M.S., notes that "I was particularly struck by the amount of surgical work which is being done in the Hospital. I feel sure that the institution is greatly appreciated by the people of this State."

One of the most notable features of the work carried out by the Kashmir C.M.S. Hospital is the village tours. In the spring Dr. C. Vosper, M.R.C.S., L.R.C.P., took a travelling dispensary to the west end of the Kashmir Valley, where over 1,500 patients were seen; and in the late autumn a visit was paid to the east and of the Valley. As many as 500 patients a day are seen on these tours; dyspepsia, rheumatism, and eye troubles being the diseases chiefly encountered.

About one-third of the patients at the Hospital are women and children, and Dr. Neve comments on the improvement in physique of the latter under good conditions of diet and nursing. There is comparatively little maternity work, but what there is, is of the utmost importance and gravity. Osteomalacia and dystocia are common, and 191 Cæsarian sections have been carried out since 1915. An interesting account is given by Dr. Neve of visits to and medical missionary work in Peshawar, Dera Ismail Khan, and Quetta; all three are important centres for such work, though Afghanistan itself is as yet inaccessible. A special feature of the year was the Kashmir Exhibition—a miniature Wembley, which illustrated, among many other activities, the possibilities of the local production of drugs, alkaloids, essential oils, etc., in Kashmir itself, in place of having to import such necessities at high cost from Europe and America.

Turning to the more purely professional side of the report, it is noted that cholera shows a marked tendency to occur in epidemic form at five-year intervals, with none in the intervals; thus 1910 and 1924 were both epidemic years, there being 22,000 cases with a case mortality of about 50 per cent. in the latter year. The year 1929 saw about 200 to 300 cases in October scattered widely throughout the Valley and Srinagar, and an epidemic was feared in 1930. Tuberculosis appears to be rapidly on the increase in Kashmir; in Srinagar of 500 private patients seen 16 per cent. were tuberculous, and 11 per cent. of in-patients admitted. With regard to cataract "We have no routine method. Each case is treated on its own merits. Sympathetic ophthalmia is very rare; this permits of eyes being saved which in European practice would be removed." With regard to osteomyelitis, etc., "the hospital sometimes presents the aspect of a special institution for the treatment of necrosis and caries." Tuberculous joint disease is common. There were 74 cases of Kangri burn cancer during the year. The total number of surgical operations, major and minor, was 6,015, with only 19 deaths after operation. Dr. Neve, however, considers that it may be unwise from motives of policy to accept high risks, as public opinion is not sufficiently educated to understand the position. In the table of major operations performed tumours head the list—329 cases; then eye operations, 220; bone and joint operations, 200, and abdominal sections, 66.

By the death of Sister Lucy McCormick in February, Nursing Superintendent, the Mission lost one of its most able and valuable workers, who had put in eighteen years of devoted service.

The financial statement shows that the expenditure for the year was Rs. 58,755—including the purchase of Rs. 5,030 War Loan Bonds, and a sum of Rs. 3,000 transferred to fixed deposit. The income was derived partly by donations and subscriptions, Rs. 14,208; fees, Rs. 12,008; remittances from missionary societies in Great Britain, Rs. 13,430; and a State grant of Rs. 10,085. The hospital is to a very great extent dependent upon public support, and its splendid record entitles it to such support to the fullest extent.

# THE MISSION TO LEPERS. REPORT OF THE 55TH YEAR'S WORK IN INDIA, SEPTEMBER 1928 TO AUGUST 1929.

THIS report, illustrated by most interesting photographs, records a year of steady progress. On December 31st, 1928, there were 5,581 lepers and 769 healthy children in the various homes in India and Burma. In addition to this, 1,372 lepers were being helped by the Mission in asylums for which it is not financially responsible, but to which it makes grants-in-aid. The income was Rs. 7,86,586 as compared with Rs. 8,15,200 in the previous year, and unfortunately for the second year in succession there was an excess of expenditure over income. A special appeal made in Bihar and Orissa raised a sum of Rs. 34,847.

"The treatment of the disease by modern methods continues to give enough encouragement to create an atmosphere of hope, and enough disappointment to sober a too facile optimism," states the report. During 1928, 245 cases in the homes became entirely symptom-free of active signs of the disease; in the great majority of treated cases there was definite improvement; in many cases improvement continues to a point, and then comes to a stop. In many cases, especially among out-patients, the patients cease treatment just at the moment when they should continue it for some months more. Where nerve destruction is already complete, the parts continue to decay. Yet the treatment at the homes is so popular that applicants have to be turned away daily for want of accommodation.

The public value of the work of the Mission to Lepers is perhaps not sufficiently realised. In the first place comes its propaganda value. Secondly, its work lies especially among those classes of the community which are least able to observe the rules of self-segregation at home, and every attempt is made to admit and segregate such cases as are in the infective stage. Thus at Purulia, in addition to the very early and very advanced cases, there were no less than 432 infective patients under segregation. An instance is quoted in the report where one infectious leper is known to have infected 111 other persons. The third great work of the Mission is to rescue the children of lepers by the provision of separate homes for those who are still uninfected; over 700 such children have been saved from infection.

The bulk of the report consists of sectional reports from the different provinces. At Bankura 165 patients were under treatment, of whom 7 were discharged symptom-free during the year. At Raniganj a separate out-patient department was installed at Rajbandh and over 600 patients attended, the highest attendance on one day being 374. At Purulia "the year was one of continuous and appalling pressure upon accommodation." There were over 700 inmates, and 5 additional houses, with accommodation for 60 further patients were under construction. A new tubercular ward for patients with both infections was also under construction. Over 300 operations were performed, and much laboratory work. At Miraj 30 patients were discharged symptom-free during the year. In Burma a large measure of financial support was secured locally. At Mandalay a new medical block, consisting of dispensary, laboratory, and operating theatre, was added. At Champa in the Central Provinces recent leprosy surveys in the Chattisgarh Division have increased the number of applicants for admissions; and in these Provinces no less than 1,250 lepers are housed in the Mission's homes. At Calicut four new wards were opened with accommodation for 48 additional patients. At Allahabad (Naini) Dr. Forman writes that he considers that the limits of the possibilities of treatment with hydnocarpus and chaulmoogra derivatives have been reached; in adults 6 per cent. of cures, and 65 per cent. showing definite improvement, is about the best that can be expected. Here the standard of laboratory work is at a high level, and training of male and female laboratory assistants is carried on. In Assam and in the Nizam's Dominions grants-in-aid are given; at Dichpali 31 patients were discharged symptom-free during the

year, and 87 as "free from active disease, but showing some deformity." The reports from almost every one of the homes speak of physical exercises, games, gardening and other industries, etc.

With regard to the children of lepers, there were 769 healthy children in the homes, as against 265 who had become infected before they could be segregated. It is to be noted, however, that the disease is especially amenable to treatment among such early cases in children; at Allahabad 75 per cent. of the total cases which became symptom-free were among the children.

Financially the expenditure of Rs. 7,86,586 during the year was met by a grant of Rs. 4,09,592 from the Mission to Lepers, Rs. 33,811 from contributions made direct to the Mission's institutions, and Rs. 3,43,183 from government and local grants.

A special feature of the report is a candid and important review by Dr. J. Lowe, the Superintendent at Dichpali, of the present position with regard to the treatment of leprosy, on p. 29. The following abstract is taken from this:—

"Up till January, 1928, the routine treatment was the subcutaneous infiltration, if possible, of the lesions with ethyl esters of hydnocarpus oil with 4 per cent. creosote, doses 1 c.c. to 10 c.c. twice a week. The lesions were painted with trichloroacetic acid, 1 in 1 or 1 in 2 strengths, and nasal treatment was also given, as described later, to those with nasal lesions. This treatment was slow but sure, and nearly every case improved, more or less markedly. With a view to improving the results of treatment the following drugs were tried:

"1. *Potassium Iodide given by the mouth.*—The strong advocacy of this treatment by leprosy workers of experience led us to try it. The method and technique advocated by Dr. Muir was used during the year on about 300 patients. On the whole the results of the treatment have been very disappointing. Many patients would not tolerate the treatment, owing to the severe reaction and general weakness it produced, and in those who did tolerate it the improvement was not marked in many cases: sometimes it was very slight and some patients got permanently worse. We have found that the greatest difficulties encountered in this treatment are, first, nerve reaction with resulting increase in anaesthesia; secondly, the general weakness caused by leprosy reaction; and, thirdly, weakness caused by the drug itself in the absence of reaction. We do not recommend potassium iodide as a general treatment for leprosy, but we think it is useful in a small number of picked cases. We think that the best cases for this treatment are those in whom nerve lesions are slight or absent, and skin lesions are not extensive, i.e., in the B I stage of the disease.

"2. *Potassium Antimony Tartrate.*—This has been used not as a general treatment for leprosy, but as a treatment for leprosy reaction. It has been given in doses of 0.02 gram intravenously, and we have found that in many cases it has a marked effect; but later on, with recurring reactions, the effect seems to get less and less marked. We think, however, that in this drug we have a very useful aid to leprosy treatment.

"3. *Sodium Hydnocarpate Anthelmintica.*—Two per cent., in doses from two to eight c.c., given intravenously twice a week. This treatment was used in about 250 cases for six months. The injections were tolerated well, giving rise to very little pain or fever and rarely causing leprosy reaction, but the improvement in these cases was not marked and this treatment has been practically given up.

"4. *Sodium Hydnocarpate Wightiana.*—Given in the same way, in most cases after a few weeks caused blocking of the veins, and so this treatment was discontinued.

"5. *Thyroid Extract*, in doses of from five to fifteen grains daily. This treatment has been in use for only a short time and on a small number of cases. It seems to have the same effect as potassium iodide, causing leprosy reaction, but this effect is less marked. The results of this treatment have not been striking, but it is too soon to form any sound opinion.



"We do not think that any of these treatments are any marked advance on our older methods. There seems to be little difference between the results of treatment by hydnocarpus esters and by hydnocarpus oil itself, but we believe that the most effective method of administration is by infiltration of the lesions themselves. The esters, being more fluid, can be given with a finer needle, with more ease to the doctor and less pain to the patient. Trichloroacetic acid for painting on the lesions, and P.A.T. for treating reaction, are valuable aids. We are more convinced than ever of the value of the local treatment of the nasal lesions. It seems most probable that the nasal discharge is the commonest means by which the infection is spread. We have found that in our patients with active nasal lesions, in about 50 per cent. the nasal discharge becomes negative within six months. The treatment we advocate is the daily irrigation of the nose with saline or a weak antiseptic, followed by dropping in a few drops of E.C.C.O. mixture. But we have not mentioned that factor which, with increasing experience, we have found to be perhaps the most vital thing in leprosy treatment, namely, the maintenance of the physical strength of the patient to enable him to fight the disease, and this is where such treatments as potassium iodide fail in many cases. They lower too much the patient's strength. Adequate and suitable diet and sufficient exercise is of vital importance in leprosy treatment."

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

HIS EXCELLENCY the Grand Master of the Most Eminent Order of the Indian Empire is pleased to announce that His Imperial Majesty the King-Emperor of India has been graciously pleased to make the following appointments to the said Order:—

#### To be Companions.

Major-General G. Tate, I.M.S.

Lieutenant-Colonel W. J. Powell, I.M.S.

Lieutenant-Colonel H. R. Dutton, I.M.S.

Colonel C. A. Sprawson, C.I.E., M.D., F.R.C.P., V.H.S., I.M.S., Inspector-General of Civil Hospitals, United Provinces, is appointed Surgeon-General with the Government of Madras, with effect from the 16th April, 1930.

Lieutenant-Colonel H. R. Nutt, M.D., F.R.C.S., I.M.S., officiating Inspector-General of Civil Hospitals, United Provinces, is confirmed in that appointment, with effect from the 16th April, 1930.

The services of Lieutenant-Colonel J. A. S. Phillips, I.M.S., are placed permanently at the disposal of the Government of Bihar and Orissa, with effect from the 11th April, 1930, for appointment as Director of Public Health, Bihar and Orissa.

Lieutenant-Colonel P. L. O'Neill, C.I.E., I.M.S., is appointed Inspector-General of Civil Hospitals, Burma, with effect from the afternoon of the 16th June, 1930.

The services of Major M. A. Singh, I.M.S., are placed permanently at the disposal of the Government of Bengal, with effect from the 3rd April, 1930, for employment in the Jails Department.

The services of Major S. R. Prall, M.B., I.M.S., and Major J. S. Galvin, M.B., I.M.S., are placed temporarily at the disposal of the Government of Bombay, with effect from the dates they assume charge of their civil duties.

The services of Major P. A. Dargan, I.M.S., are placed temporarily at the disposal of the Government of the Punjab, with effect from the date on which he assumes charge of his duties.

The services of Major I. S. Nalwa, I.M.S., are placed temporarily at the disposal of the Government of Burma for employment in the Jails Department, with effect from the date on which he assumes charge of his duties. Home Department Notification regarding the

transfer of Major N. M. P. Dotivala, I.M.S., to Burma is cancelled.

Lieutenant S. M. K. Mallick, M.B., I.M.S., a temporary officer of the Medical Research Department, is appointed to officiate as Assistant Director, Central Research Institute, Kasauli, with effect from the 1st September, 1929, to the 28th April, 1930, *vice* Major G. C. Maitra, I.M.S., and from the 29th April, 1930, until further orders, *vice* Major C. de C. Martin, M.B., I.M.S., granted leave.

The undermentioned appointments are made.

#### To be Captains (on probation).

John McMahon Wilder, 22nd February 1930, with seniority 28th September, 1924.

Ederic Grahame Hurd-Wood, M.B., 22nd February, 1930, with seniority 30th May, 1926.

William Thomas Taylor, M.B., 4th February, 1930, with seniority 11th September, 1928.

#### To be Lieutenants (on probation).

Aziz Khan Mohamed Khan, M.B., 4th February, 1930, with seniority 15th July, 1927.

Francis Harmar Alastair Lascelles Davidson, M.B., 4th February, 1930, with seniority 4th February, 1929.

James Hamilton Gorman, M.B., 4th February, 1930, with seniority 4th February, 1929.

Robert Thomas Hicks, 22nd April, 1930, with seniority 22nd April, 1929.

Sorab Merwan Kharegat, M.B., 4th February, 1930, with seniority 15th July, 1929.

Ryder Carrel Dracup, M.B., 4th February, 1930, with seniority 6th November, 1929.

Alexander Brown Guild, M.B., 4th February, 1930.

William Fleming, M.B., 22nd February, 1930.

### LEAVE.

Lieutenant-Colonel A. S. Leslie, I.M.S., is granted leave on average pay for eight months and leave on half average pay for 14 months from the 1st October, 1930, or date of relief.

In modification of G. O. No. R. 50 P. H., dated 15th March, 1930, Lieutenant-Colonel F. C. Rogers, I.M.S., is granted leave on average pay for 2 months and 20 days, on half average pay for 1 month and 16 days and leave not due on half average pay for 6 months, with effect from the 24th April, 1930 (afternoon), preparatory to retirement.

Lieutenant-Colonel M. S. Irani, I.M.S., Superintendent of Matheran, is granted leave on average pay for 4 months, with effect from 20th June, 1930.

### PROMOTIONS.

#### Colonel to be Major-General.

C. A. Sprawson, C.I.E., M.D., F.R.C.P., V.H.S. Dated 1st April, 1930.

### RETIREMENTS.

Colonel A. B. Fry, C.B., C.I.E., D.S.O., M.D., 1st April, 1930.

Lieutenant-Colonel F. H. Salisbury, M.B., 4th May, 1930.

Lieutenant-Colonel J. C. S. Oxley, I.M.S., dated 15th November, 1929.

Lieutenant-Colonel C. H. Fielding, I.M.S., 23rd May, 1930.

Lieutenant-Colonel C. B. McConaghy, M.B., I.M.S., 24th May, 1930.

### RELINQUISHMENT OF RANK.

Captain D. H. Mirchandani late I.M.S. (T. C.) relinquishes the rank of Captain.

## Notes.

### THE "ECLIPSE" SPRAYER.

ON p. 299 of our issue for May 1930, we referred to the "Eclipse Sprayer." As we were in some doubt



about the use of kerosene oil in this apparatus as a larvicide, we referred the matter to the makers, the Eclipse Spraying Co., Rawlings Road, Bearwood, Smethwick, England. In reply they write that kerosene oil and emulsions can be used freely, as the only part of the apparatus which contains rubber is the connection with rubber tubing, which is not affected. Naphtha solutions, however, should not be used.



The portable hand apparatus—which is issued by Messrs. Barlow & Co., 37, Strand Road, Calcutta, at Rs. 17 ex godown—was sent to us, and was made over to the Entomology Department of the Calcutta School of Tropical Medicine for practical testing. The report is as follows, and clearly shows that this portable apparatus is of value as a larvicide against mosquito larvæ:—

"This sprayer is a powerfully constructed metallised syringe, quite light and can be handled and worked without any difficulty. Its mechanism is simple and there is no intricate part which requires any close attention. It is worked on the principle of an ordinary suction pump, and is specially serviceable to the householder, gardener and dairy farmer.

Every householder will find in it a convenient and at the same time a cheap apparatus by means of which he can keep his house free from insects like spiders, ants, mosquitoes, flies and bugs. As the jet is strong and forcible the fluid can easily penetrate into cracks, crevices and corners, which adds to its usefulness. One can also successfully tackle mosquito larvæ which are invariably found in garden pots during the rains by using an insecticide of a thin consistency, e.g., kerosene oil. It is by far the simplest and most efficient spraying device by which lime-washing and disinfection of the walls can be easily done.

The gardener is always troubled with insect pests which can alone be eradicated by some insecticide sprayed on the insects by a suitable sprayer. He will specially appreciate the mechanism by which a long delivery hose with a combination of nozzles can be fixed to the sprayer and thus a height of 20 to 25 feet can be reached without much difficulty; hence every part of a fruit tree can be efficiently sprayed.

The veterinarian, the dairy man or the cattle breeder will find in the 'Eclipse Sprayer' an equally efficient apparatus for spraying and drenching his stock and for lime-washing and creosoting his farm."

## A MEDICINAL TREATMENT FOR CATARACT.

WHATEVER the true pathogenesis of cataract, the variety most commonly encountered is the senile one, and the condition is essentially one associated with senility. As such its onset may be associated with defective activity of the endocrine glands, including the gonads. Diabetic cataract is probably an instance of cataract due to endocrine defect.

Professor A. Siegrist, Director of the University Ophthalmological Hospital, Berne, has been experimenting for some years in the prevention and treatment of cataract by administration of endocrine products. In 1917 a tablet preparation was manufactured to his instructions, and administered to 32 cases of early senile cataract. In 31 of them, it is claimed, the condition remained stationary and did not advance. A paper on the subject was read by Professor Siegrist at the Congress of the German Ophthalmological Society held at Heidelberg in 1927.

This preparation has now been put on the market by Wiernik & Co., of Berlin, under the trade name of "Euphakin," and on the British market by Messrs. Coates & Cooper, 41, Great Tower Street, London, E.C. 3, under the trade name of "Paraphakin." The dosage recommended is one tablet three times a day for 25 days; then an interval of 25 days, then a second course of 25 days similar to the first. If the patient has cardiac trouble, the course of treatment should be reduced to 8 days. The preparation is marketed at 7s. 6d. per bottle of 100 tablets.

Cataract is such an ever-present problem in India that some of our readers may be interested in this new preparation.

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## Original Articles.

### RECORDS OF FINDINGS OF ADULT *WUCHERERIA (FILARIA) BANCROFTI* IN INDIA.

By S. SUNDAR RAO, L.M.P.,

*Filariosis Research Worker, Calcutta School of Tropical  
Medicine and Hygiene.*

ALTHOUGH filariasis is endemic in several parts of India, the number of adult *Wuchereria (Filaria) bancrofti* so far recovered is comparatively very small. There are barely a few records of adult filariæ recovered from patients in India, and in most of these cases only bits of worms were obtained. Lewis's first specimens were bits of a male and of a female, about half an inch long from a case in Calcutta (Lewis, 1877). Sibthorpe's (1889) specimens were also not entire. The seven specimens of dead worms recorded by Maitland (1894) had in all probability been greatly disintegrated by the process he employed of treating the tissue with nitric acid and chlorate of potash solution for separating out the worms. Cruickshank and Wright (1913-14) obtained four entire males and one female at Cochin. These are the only records of adult worms recovered from cases in India. Considering the heavy incidence of filarial infection in many parts of this country, the extreme paucity of adult filariæ recovered hitherto is unfortunate. As a matter of fact, adult filariæ were not available for study anywhere in India.

This paucity of adult worms seems to be due neither to any lack of material, nor to any scantiness of infection. The author has, within two years' intensive search for adult filariæ, recovered over a dozen specimens in Calcutta. It is thus seen that the rarity of the meeting with adult filariæ is due to the worms having been missed or overlooked. When a case is on the table, attention is directed almost entirely on to the operation in progress and few surgeons would go out of their line to search for these worms, unless they are specially interested in them.

Since 1927 the author has been trying to obtain a good collection of entire adult worms for intensive study and he has had remarkable success so far. The cases of operation from which adult worms were obtained are discussed in the present article.\*

In the course of these investigations conducted at Calcutta, adult filariæ were observed in

the following situations, namely inside abscesses, glands, lymph-varices and cysts. The cases from which adult worms were recovered exhibit some very characteristic features and they are briefly described below.

The first case was that of a lymph-varix which was removed at an operation by Lieut.-Col. W. L. Harnett, I.M.S. The excised material was examined by the writer and on dissecting the lymph-varix, two bits of a female worm were obtained and they were quite alive and active and exhibited slow lashing movements. It seems likely that the adult worm was severed during the operation or during the subsequent dissection of the lymph-varix. The patient was a Bengali, aged 25, who had been suffering from lymph-varix of the right inguinal region for three years previously. His blood was positive for microfilariae. Subsequent to this case, the author examined several lymph-varices removed at operation by Lieut.-Col. Harnett, I.M.S., and Lieut.-Col. Sir F. P. Connor, I.M.S., none of which showed any trace of adult filariæ.

The second case was that of an abscess on the inner side of the left forearm in a Bengali aged 40. The abscess opened by itself, and from the discharge three worms, two males and one female, which were coiled together were isolated. These worms were handed over to Dr. Maplestone, whose description of the male has since been published.† This patient suffered from recurring attacks of lymphangitis of the forearm prior to the development of the abscess. Since the formation of the abscess, and the discharge of the worms with the pus, the patient has remained free from attacks of lymphangitis. The author is indebted to Dr. M. N. Mallick, M.B., for his assistance in studying this case.

The third case was another instance of an abscess from which adult filariæ were recovered. The circumstances of this case throw an interesting light on the etiology of filarial diseases and have been discussed in detail in an earlier paper (Acton and Rao, 1929). The patient, S. C. M., aged 24, was admitted to hospital with high fever, which had persisted for nearly a week previously, and an abscess in the right femoral region. The same patient was on a previous occasion admitted into hospital with a severe attack of urticaria, and in the course of the routine tests done at the time it was found that his blood was positive for microfilariae. It was therefore suspected that the case was probably one of filarial abscess. From inside this abscess two long bits of live adult filariæ measuring 22 and 10 mm. long and 103 $\mu$  to 145 $\mu$  thick (head end 60 $\mu$  to 68 $\mu$  thick) were recovered from the blood clot. Only the

\* In a large number of post-mortem cases, the glands and lymphatics were sectioned for the detection of presence of filariæ; in many instances filariæ were observed in section in such material, but as entire worms were not obtained in any of these they are not discussed in the present article.

† Maplestone, P. A. "A redescription of *Wuchereria bancrofti* (Cobbold, 1877), with special reference to the tail of the male." *Indian Journ. Med. Res.*, Vol. XVI, Jan. 1929.

anterior portions of these worms were obtained; the posterior ends were missed. There is no doubt that the abscess was a typical filarial one.

The fourth case, B. S., aged 35, was admitted (August 1929) with enlarged inguinal glands of the left side. In this case, although the blood was negative for microfilariae, clinical evidence pointed to a filarial infection of the inguinal glands. The glands were excised under local anaesthesia and three adult filariae actively coiling and uncoiling were observed from one of them. The worms were separated out and the glands then imbedded for sectioning. Serial sections of these glands were cut and in these sections many more mature filariae were found in the lumen of the lymphatic vessels. It is interesting to note that although the worms recovered from these glands were quite mature and full of embryos, the blood of the patient was negative for microfilariae.

This is an interesting case, as except for the enlargement of the inguinal glands, there was no evidence of filarial infection, there being no lymphangitis, or any other filarial manifestation; the blood was entirely negative for microfilariae.

This patient was in charge of Dr. E. Muir, M.D., F.R.C.S. (Ed.), and the author is much indebted to him for his help in facilitating this investigation.

The fifth case, B. G., an Anglo-Indian girl, aged 12, Calcutta, was admitted (September 1929) with an abscess in the right inguinal region and a temperature of  $101^{\circ}\text{F}$ . The abscess was opened and from the discharge one long bit of female adult filaria measuring 32 mm. long and several bits of adults were recognised and separated out. These worms were full of eggs in different stages of development.

The last (sixth) case of this series and perhaps the most interesting is N. D., a Bengali, aged 46, a resident of Calcutta, who was admitted (March 1930) for a cyst on the left elbow, about an inch in diameter. The cyst was quite painless and had developed very slowly; it reached this size in a year's time. It was by sheer chance the author got at this case, as there was nothing suggesting filarial infection in the case-history. The cyst was tapped and 5 c.c. of clear serous fluid was obtained from it. This fluid on microscopical examination showed innumerable live and active microfilariae. After the tapping the cyst wall collapsed but the cyst had filled again within a few days. From the presence of numerous microfilariae in the cyst fluid, it was surmised that the cyst probably harboured adult filariae. It was arranged therefore to remove the cyst by operation. The operation was performed under local anaesthesia by Lieut.-Col. Harnett, I.M.S., to whom the author is indebted for his generous help. When the dissected-out cyst

was placed in normal saline, five entire and live worms (2 males and 3 females) wriggled out slowly from the cyst into the saline. Thus the conjecture that the cyst contained filariae was luckily correct. It was very instructive to observe the movements of these live filariae. Figure 1 shows a microphotograph of a male and a female worm coiled up together, which were removed from the cyst.

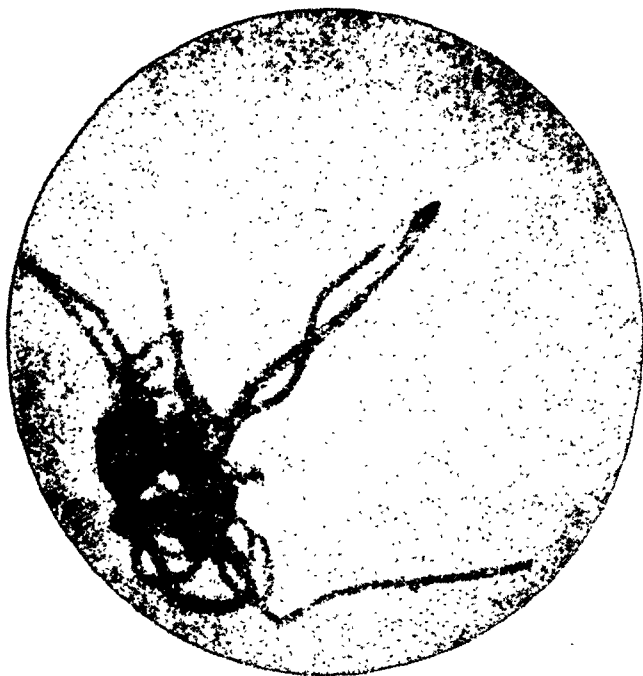


Fig. 1.—Microphotograph of a male and a female adult filariae coiled together. Living condition.

The author kept these worms alive for several hours in saline and watched their movements. The manner in which the worms coil and uncoil, become wavy and stiffen out is very

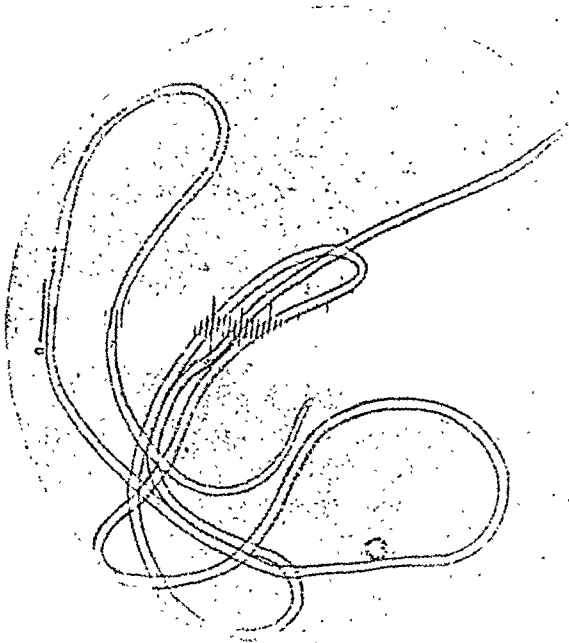


Fig. 2.—Microphotograph of a female adult filaria. Length—58.5 mm.

characteristic, and these movements throw light on the effect of the filariae within the lymphatics. The presence of a group of live

worms coiling and uncoiling and constantly rubbing against the inner wall of the vessel should by itself be a great irritation and produce the resultant reaction. This combined with the discharge from the uterus would easily bring about the eosinophile reaction and consequent pathological changes previously discussed by Acton and Rao (1929a). It is considered that this characteristic movement of the worm plays a considerable rôle in the etiology of filarial diseases.

As previously mentioned the lack of literature on adult filariæ cannot be due to any paucity of infection. From the author's observations even in Calcutta, which is really not as highly an endemic area as certain other parts of India, the incidence of adult filariæ among early stage cases of filarial diseases is fairly high. They have been missed because they were not specially searched for, and in many cases when they were chanced upon, they have been overlooked.

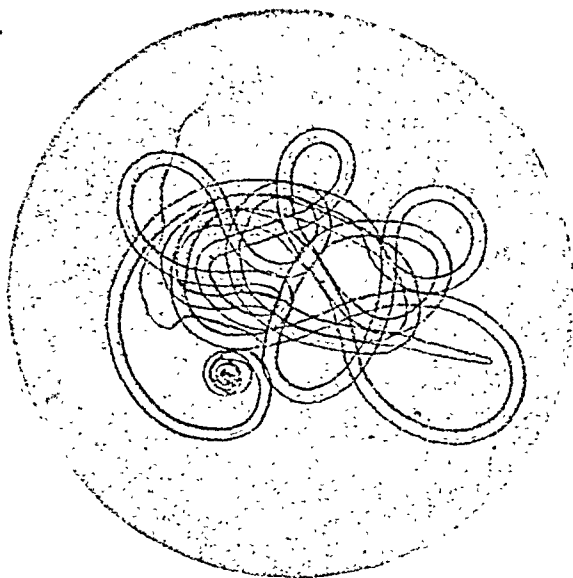


Fig. 3.—Microphotograph of a male adult filaria.  
Length—28.2 mm.

Cases of abscesses from endemic areas, especially abscesses situated along the main lymphatics, appear to be fertile sources of adult filariæ. The worms in these abscesses are very close to the skin, and are usually the first thing to emerge when the abscess opens naturally or when opened by operation. The author suggests the collecting of the pus and blood in a dish with normal saline and subsequently searching for the worm carefully. Usually only dead worms can be isolated from such abscesses. Any white thread-like structures should be pipetted out on a slide and examined under the microscope.

In operations on lymph-varix the portion that is excised is usually the dilated lymphatic mass below the actual obstruction caused by the filariæ, as such there is very little chance of our obtaining adult filariæ from the portions

excised by the surgeons. This explains why the author was not able to get any adult worms from the examination of a great deal of such material. The particular lymph-varix from which the adult worm was obtained (*vide* Case No. 1) was probably a very early case in which the worm had strayed into the dilated lymphatics. Lymph-varices are usually not a likely situation in which to obtain adult filariæ.

A large proportion of enlarged glands in endemic areas are mainly filarial in origin and these glands are fertile material for obtaining adult filariæ. In many of these cases the blood may be negative for microfilariae and there may not have been any history of lymphangitis and yet the glands may harbour several mature filariæ, as was seen in Case No. 4 discussed above.

Cysts situated on the lymphatics are another important source of adult filariæ. These, however, are very rare, but the possibility of such

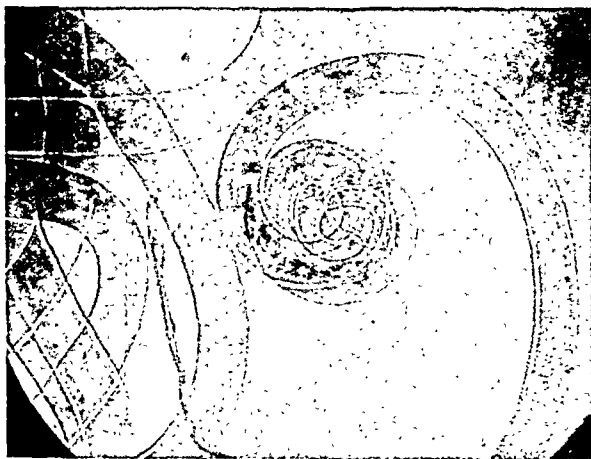


Fig. 4.—Microphotograph of a male adult filaria.  
Tail end.

cysts occurring in endemic areas should be kept in mind.

In conclusion, the author desires to express his grateful thanks to Lieut.-Col. H. W. Acton, I.M.S., for the invaluable advice and kind encouragement received during the course of these investigations.

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## RADIUM THERAPY.

### A SUMMARY OF A YEAR'S WORK, WITH A DETAILED DESCRIPTION OF SOME CASES.

By M. L. TRESTON, F.R.C.S.,

MAJOR, I.M.S.,

Civil Surgeon, Rangoon, Burma.

#### Introduction.

From a scientific standpoint, radium was introduced to Burma, for the first time, in September 1928, when I was permitted to purchase 100 mgrms. of radium element, for the Dufferin Hospital, Rangoon, of which I was then Superintendent. The radium was in the form of four needles, of approximately 25 mgrm. R, each. A platinum container, of the requisite thickness, served to contain one or more of these needles for intra-uterine application, and this container had a platinum rod, screwed into the screw-on top, to facilitate removal of the apparatus.

#### Abstract of cases.

In all, 40 cases were treated during the year. The number of milligramme-hours given to the various cases is outlined in the following table:—

#### Milligramme-hours.

	10,400	9,700	7,200	5,400	4,800	3,600	2,400	2,000	1,600	600
No. of cases.	1	1	3	1	16	1	12	1	3	1

Total number of applications of radium 67.

The type of cases treated is outlined below:—

Carcinoma cervicis uteri ..	..	30
Carcinoma corporis uteri ..	..	1
Carcinoma mammæ ..	..	2
Other cancers ..	..	2
Menopausal hæmorrhage ..	..	4
Puberty hæmorrhage ..	..	1

Of this list, only three cancer cases were operable—one of the corpus uteri, and two of the cervix uteri. Carcinoma cervicis uteri was, therefore, the main type treated, and the procedure adopted was to place 100 mgrms. of radium element, effectively screened, in the cervical canal and uterine cavity. The vagina was then carefully packed, and a self-retaining catheter inserted, in this way preventing radium burns. Prior to the insertion of the radium, a portion of the cancerous area was excised and submitted to microscopical examination. One week after the first application, a further similar application was given, after which the patient was discharged, and directed to report for examination at stated intervals.

In certain cases, where the cancer was more of the cauliflower type, the radium needles, unscreened, were implanted in the growth for 24 hours, and a week later an intra-uterine application of 2,400 mgrm. hours was given.

In only one case was abdominal section done, and the needles embedded in the growth in the pelvis (*vide* Cases 4 and 21a).

In a fairly large proportion of cases, however, it was not possible to give more than one application of radium. Some patients left hospital, some were too weak to permit of a second application, others again gave a fairly long pyrexial reaction which precluded further radium treatment.

In carcinoma corporis uteri, intra-uterine application only was adopted. Of the other cancers, one was a cancer of the lip, two of the breast, and one was a mixed parotid tumour. In these cases needling was performed under local anæsthetic.

The intra-uterine application of radium required no anæsthetic in the majority of cases, and a small amount of 1 per cent. Novocaine sufficed for burying needles.

#### Results of cases.

Type.	Cured.	Improved.	Recurred.	Died.
Carcinoma cervicis uteri ..	0	23	7	6
Carcinoma corporis uteri ..	0	1	0	0
Carcinoma mammæ ..	0	1	0	1
Other cancers ..	0	2	0	0
Menopausal hæmorrhage ..	4	0	0	0
Puberty hæmorrhage ..	1	0	0	0

Menopausal hæmorrhage, invariably a chronic metritis of the chronic sub-involution type, responded excellently to radium therapy, as also did the patient with puberty hæmorrhage, whose life was actually despaired of.

#### Complications arising during treatment.

For the first six months every case of cancer which presented itself was given radium treatment. It was soon discovered, however, that there is such a thing as a definite radium risk, and the application of radium to such cases—cases with marked anæmia, and toxæmia from septic absorption—was a much more risky procedure than a major operation. As a consequence a certain selection of cases became advisable, some being so far advanced as to definitely contra-indicate radium, in the light of previous experience.

Bladder complications were very few, and then only of a minor nature. But in four cases a pseudo-dysentery, characterised by diarrhœa and marked bleeding, was a definite feature. Again in six cases prolonged fever, without any physical signs in the pelvis or elsewhere, started at varying intervals after the application of radium. Sometimes the fever came on after the first application, but more often after the second. Headache for 24 hours was a more or less constant symptom and reacted to aspirin.

#### Suggestions and conclusions.

Out of 40 cases there were no less than 7 deaths. This represents a very high mortality

even when one considers that the majority of cases were in a very advanced stage of cancer. In such advanced cases a radium tolerance might well be established by starting with small doses, say 600 milligramme-hours, and cautiously increasing the dosage.

In such a short period as the one under review nothing definite can be stated under the heading "cured." The "follow-up" is extremely difficult in most cases, as some patients lived a long distance from the hospital, and others were too indolent to come up as long as there was no pain and the discharge was slight.

That a great number of cases were markedly relieved is undoubted, the results in some cases being almost magical, disappearance of a foul-smelling discharge, and increase in health and well-being, and from that standpoint alone the value of radium in the treatment of such cancers cannot be questioned.

Only one case of cancer of the body of the uterus was treated, and one malignant polypus of the cervix. Both these cases were free six months after treatment.

There rests still the question of operability of the cancers treated, and this is outlined in the following table:—

	Operable.	Inoperable.	Total.
Carcinoma cervicis uteri	2	28	30
Carcinoma corporis uteri	1	0	1
Carcinoma mammae ..	0	2	2
Other cancers ..	0	2	2

In conclusion, I wish to take this opportunity of expressing my gratitude to Dr. K. W. Ferguson, R.A.C.S.I., for her valuable assistance with the cases, and the time and trouble she has taken in writing up and checking results.

#### Illustrative Cases.

*Case 3.—Chronic metritis.* (Chronic sub-involution.) Mrs. X., has had two children, aged 45, Parsee.

*History.*—Last child 12 years ago. Miscarriage 1, dilation and curetting 15 years ago. Bleeding for the last 35 days. Similar attack two years ago.

23-9-28. Large, hard retroverted, tethered uterus, culs clear.

*Diagnosis.*—Chronic metritis (chronic sub-involution type).

*Previous treatment.*—The British Pharmacopoeia and most patent medicines on the market.

*Radium treatment.*—Chloroform. Uterine cavity 3½ inches. D. to 8/11, Hegar. Curetting showed a thickened endometrium. 100 mgrms. of radium inserted into the uterine cavity, and removed 16 hours later. Total radium 1,600 milligramme-hours.

*Progress.*—The discharge became serous 24 hours after the operation, and ceased 4 days later. A slight serous discharge was noticed on the seventh day, which only lasted for two days.

#### Special points.—

(1) Slight rise of temperature for 24 hours after the operation; thereafter normal.

(2) Headache for the first 24 hours; reacted to aspirin.

(3) Pain in the hypogastric area, 48 hours. Urine. N. R.

(4) The pulse rate remained steady, and blood-pressure normal.

*Follow-up.*—16-12-28. Patient's doctor reported as follows:—"No menstruation since discharge from hospital on 4-10-28. Subjective symptoms of menopause."

10-1-29. No menstruation. Slight subjective symptoms of menopause.

10-6-29. Has had two slight "periods" in the last 4 months. Menopausal symptoms have passed off. Patient's general health good. Uterus in the same position as before but smaller and very hard.

The case is interesting in view of the alleged periods after 1,600 milligramme-hours of radium, and may possibly have been due to the presence of a small sub-mucous fibroid. Both the patient's babies were not full term, nor was there any history of fever during the puerperia. The dilation and curetting was done in 1913, following a miscarriage, and there was a definite history of some days' fever following the operation.

Up to date there has been no further bleeding, nor have there been any menopausal symptoms.

*Cases 4 and 21a.—Inoperable carcinoma cervicis uteri.*

Mrs. Y., European, aged 60, has had 4 children, youngest child aged 37. Menopause 15 years before.

*History.*—3-8-28. Offensive hemorrhage discharge since 28th February.

*Treatment.*—Cancer scraped thoroughly and cauterised on two occasions, with 14-day intervals, in August 1928. Microscopic examination of the growth showed it to be an *epithelioma*.

#### Radium treatment.—

2-10-28. 2,400 milligramme-hours of radium.	} 100 mgrms. radium into cervix and uterine cavity in one usual way.
9-10-28. 2,400 milligramme-hours of radium.	

*Progress.*—Prior to the first application of radium, the cervix was ragged and friable, with growth which had overrun the vaginal fornices and invaded the utero-sacral ligaments. Prior to the second application the cervix was much smoother, but had one punched out hole, the diameter of a pin's head, which ran up for 2 inches into the substance of the uterus.

The discharge became thinner, smaller in amount, and less offensive, but very gradually, and on discharge on 16-10-28 there was still a sero-purulent discharge from the vagina, which was, however, small in amount and not offensive.

Radium did not give rise to any symptoms. There was no headache, nothing pointing to vesical irritability, and the blood-pressure remained constant throughout. Backache, a prominent symptom prior to radium treatment, cleared up 4 days after the first application.

*Follow-up.*—14-12-28. Induration of the vaginal vault. Extensions into the utero-sacral ligaments, *in statu quo*. No pain, no vaginal discharge, patient's general condition good.

21-5-29. Reported complaining of pain in the lower abdomen and a commencing vaginal discharge.

On examination. Cervix smooth and regular in outline. Extension to parametric tissue both sides, and to body of uterus.

#### 3-6-29. Abdominal section.—

(1) Ulcerating growth in right parametrium, invading the body of the uterus, and the base of the bladder.

(2) Two carcinomatous bosses on the right and one on the left side of the fundus.

(3) Pelvis clear, except for a hard freely movable nodule in the left parametrium.

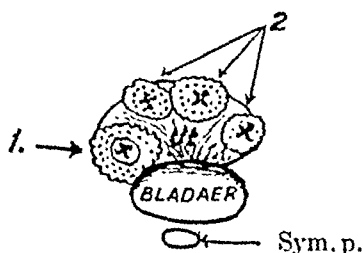
(4) Base of bladder thickened and fibrosed. Four radium needles, each 25 mgrm. R, inserted as shown in the sketch. These were removed after 48 hours. There was no difficulty experienced in removing the needles, and the patient made an uninterrupted recovery. On discharge from hospital on 15-7-29 there was no discharge and the patient was free from pain. The uterus was much smaller and movable. There was no bladder discomfort. Backache, which was again a prominent symptom, disappeared 4 weeks after the abdominal operation. A report, received six months after discharge from hospital the second time, was to



the effect that the patient was well, with the exception of some bladder irritability.

The total radium given in this case was 9,700 milligramme-hours.

Fig. 1.



X. Marks the point of insertion of the radium needles.

**Case 7.—Inoperable carcinoma cervicis uteri.**

Ma T. M., Burmese, has had 8 children, last child 9 months ago. Patient's age 37 years.

**History.**—24-10-28. Patient presented herself complaining of pain in the lower abdomen, and an offensive discharge of 3 months' duration.

On examination there was an extensive cancer of the cervix involving the whole of the vaginal vault. The parametrium on both sides, but especially the left, and the utero-sacral ligaments, were extensively invaded. A section of the growth showed it to be an *epithelioma*.

**Radium treatment.**—29-10-28. 100 mgrms. radium inserted after a preliminary dilatation and curetting. The radium was removed in 24 hours.

8-11-28. A further 2,400 milligramme-hours of radium given.

Total radium 4,800 milligramme-hours.

**Progress.**—15-11-28. Cervix hard and smooth, but there are still some small necrotic areas. The extensions into the pelvis are smaller, much harder, and not tender. There is still a slight muco-purulent discharge, which is not offensive.

Four days after the first application of radium the patient developed an acute colitis, which cleared up in 7 days.

The pain in the abdomen, a prominent symptom, at first got very much worse for two days after the first radium but it then rapidly diminished, and was absent on the 7th day of treatment with radium, and subsequently. No headache nor urinary symptoms were complained of in this case.

**Follow-up.**—12-12-28. Cervix smooth and clear. Slight serous discharge. Body of uterus anteverted and movable. Right cul clear. Extension still present in left cul, but smaller and very hard.

12-6-29. Body of uterus hard, smooth and to the left, where it is tethered. Right cul clear. Left cul shows fibrous thickening. Cervix smooth, but with a small irregularity of mucous membrane, at a point on the left lateral aspect of the external os. No friability, and no tendency to bleeding. Discharge still present, but slight and serous.

**Case 8.—Adeno-carcinoma corporis uteri.**

Mrs. W. B., Chinese, aged 31, has had 1 child, 10 years ago. No miscarriages.

**History.**—25-11-28. The patient presented herself complaining of a protrusion at the vulva and a vague history of bleeding from the vagina of 8 months' duration.

On examination there was a utero-vaginal prolapse, with a very thickened and engorged cervix.

28-11-28. Fothergill's operation for prolapse. The uterine cavity was 4½ inches, of which 2 inches represented the cervix. On curetting it was noticed that the endometrium was grey and abundant, and though neither friable nor hæmorrhagic, showed a ragged adherence in the region of the internal os. Microscopic examination of the endometrium showed *adeno-carcinoma*.

**Radium treatment.**—8-12-28. 100 mgrms. of radium inserted and removed after 24 hours.

Total radium 2,400 milligramme-hours.

**Progress.**—Pain in the lower abdomen and back complained of, but only while radium *in situ*. There was a slight transient rise of temperature, otherwise there were no symptoms.

18-12-28, on discharge. There was no discharge of any sort from the uterus, and the operation wound had healed soundly.

**Follow-up.**—16-4-29. Uterus small, erect and freely movable. Pelvis clear. No menstruation since radium treatment, but there were no subjective symptoms of the menopause. The patient came up again a month later, prior to taking a trip to her own country. The condition was the same as before and the patient's general health was excellent.

**Case 10.—Inoperable carcinoma cervicis uteri.**

Ma P., Chinese, aged 43, has had 10 children, last child 5 years ago.

**History.**—3-12-28. Patient presented herself complaining of an offensive hæmorrhagic vaginal discharge of 2 months' duration.

On examination there was a cancerous mass involving the lower 2/3rds of the vaginal cervix, and without any apparent extensions. The movement of the uterus in a vertical plane seemed to be limited however, and exploration under chloroform was advised.

5-12-28. Under chloroform a cautery amputation of the cervix was performed, apparently above the growth. On making a small opening into the utero-vesical pouch a soft mass of growth was found invading the base of the bladder. The microscopical report on the amputated cervix was returned as *epithelioma*.

**Radium treatment.**—

14-12-28. 100 mgrms. of radium inserted for 24 hours.

21-12-28. 100 mgrms. of radium inserted for 24 hours.

Total radium 4,800 milligramme-hours.

**Progress.**—There were no untoward effects either during or after treatment. The patient had no symptoms, and there was nothing abnormal noticed. The vaginal discharge became serous 2 days after the first application, and ceased altogether 4 days after the second application of radium. On discharge on 26-12-28 the cervix was hard and smooth, the corpus enlarged hard, and freely movable, and the culs clear.

**Follow-up.**—26-3-29. Cervix smooth and hard. Corpus hard and freely movable. Muco-purulent discharge, small in amount, and not offensive.

27-5-29. Uterus as before. Some contraction of the posterior fornix, no evidence of any extension of cancer anywhere. Patient's general condition good.

An early case, and one in which the end result will probably be good. Told to report every six months, but lives out in the district and will be difficult to follow up.

**Cases 12 and 12a.—Inoperable carcinoma cervicis uteri.**

Daw Y., Burmese, aged 50, has had 6 children, menopause 4 years ago.

**History.**—Patient came complaining of a slight sero-purulent vaginal discharge, weakness, and an evening rise of temperature.

23-1-29. On examination there was a cancer of the cervix involving the whole of the vaginal vault and both utero-sacral ligaments. The corpus uteri was bulky and tender.

25-1-29. Cervix dilated. Pus in fair quantity in the uterus. A drainage tube was stitched in, and intra-uterine glycerine given daily. A portion of the growth of the cervix was removed and found to be an *epithelioma*.

**Radium treatment.**—

5-2-29. 100 mgrms. radium for 24 hours.

12-2-29. 50 mgrms. radium for 24 hours.

19-2-29. 50 mgrms. radium for 24 hours.

**Progress.**—There was severe pain in the abdomen lasting for 24 hours after the first insertion only. After the second insertion painful micturition of 24 hours' duration was complained of. After the second insertion, also, there were loose watery stools, accompanied by some tenesmus, but without any blood or mucus, for a period of 4 days. The third insertion

caused headache and vertigo lasting for 2 days, and also a burning sensation in the vagina, which came on 5 days after the insertion, and lasted for 4 days. The vaginal discharge lessened after the first application of radium, but was still purulent. It became watery and very scanty on 1-3-29, ten days after the last application of radium. On discharge from hospital on 5-3-29, there was a marked improvement in the patient's general condition. The cervix was smooth and red, the corpus small and very hard. The extensions to the vaginal vault and pelvis seemed smaller, and were hard and not tender.

*Follow-up.*—17-7-29. Patient's general condition good. On the left side of the cervix, just by the external os, was a small friable irregular patch.

5-8-29. One needle (25 mgrms. of radium) was inserted into the middle of this red area on the cervix.

Total radium 5,400 milligramme-hours.

The final application gave rise to no signs or symptoms, and the patient left hospital on 10-8-29. The cervix was red and smooth, the corpus small and stony hard. There was some fibrosis of the vaginal vault, and the extensions to the pelvis were small and densely hard.

This patient, apart from her pyometra, had very bad pyorrhoea, and was suffering from toxic absorption, which must have been of long standing. Because of this, the application of radium was spread out over a longer period, and smaller doses were used.

*Case 15.—Inoperable carcinoma cervicis uteri.*

M., Hindu, aged 45, has had 10 children, last child 12 years ago.

*History.*—Admitted to the General Hospital, Rangoon, in July 1927 for inoperable cancer of the cervix, which was scraped and cauterised. The microscopical report was *epithelioma*.

Re-admitted on 22-2-29, with a very extensive cancer of the cervix, involving the upper half of the vagina, and with evidence of involvement of the parametric tissue and the pelvic glands. The cancer was again scraped and cauterised, and the microscopical report was as before *epithelioma*. The patient was very emaciated, and obviously a bad cancer risk, and it was only at the special request of her relatives that any radium treatment was given.

*Radium treatment.*—

7-3-29. 100 mgrms. of radium for 24 hours.

14-3-29. 100 mgrms. of radium for 24 hours.

*Progress.*—This patient did remarkably well. For 24 hours after each insertion she complained of pain in the lower abdomen, and ran a slight temperature which lasted for 2 days. There were no urinary or bowel symptoms, nor was headache complained of. On leaving hospital on 26-3-29 the vaginal discharge was serous and odourless. The cervix and upper half of the vagina were hard and fibrosed. Per rectum the extensions to the parametrium and pelvic glands were stony hard and not tender. The patient's general condition, even in such a short time, was very much improved.

*Follow-up.*—The patient was only seen once after radium treatment, in July 1929. The upper part of the fibrosed vagina had contracted down so as to almost obliterate a small hard cervix. There was a slight serous discharge, and the extensions to the pelvis were much as before, stony hard and not tender. The patient's general condition was good. She had put on weight, and had no complaints.

*Case 16.—Inoperable carcinoma cervicis uteri.*

Ma T. M., Burmese, aged 59, has had 5 children, menopause 5 years ago.

*History.*—Patient came complaining of a blood-stained, purulent discharge from the vagina of 5 months' duration.

5-3-29. On examination a bun-shaped cancer of the cervix mainly of the right side. The whole of the vaginal vault was involved, as was also the parametric tissue, on the right side.

*Radium treatment.*—

8-3-29. 100 mgrms. radium for 24 hours.

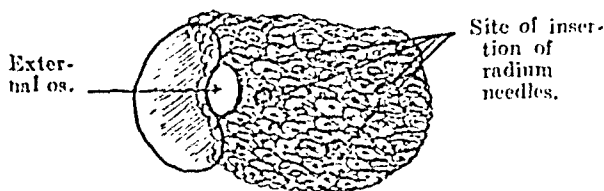
18-3-29. 100 mgrms. radium for 24 hours.

26-3-29. Four radium needles, each of 25 mgrms.

R., inserted into the carcinomatous area on the right side of the cervical canal and left for 24 hours. The needles were unprotected, and their distribution was as shown in the sketch.

Total radium 7,200 milligramme-hours.

Fig. 2.



*Progress.*—The discharge remained offensive after each application and for ten days after the final application. Then the patient got acute pain in the hypogastrium, and developed diarrhoea with the passage of tarry stools. The dysenteries were excluded by examination, and the usual treatment for diarrhoea instituted, but the tarry stools still went on to the extent of 12 to 15 in the 24 hours. There were no abdominal signs to point to the site of the bleeding, the initial pain having passed off with the onset of the diarrhoea. The patient's general condition was on the whole fair, and beyond a few crepitations in both bases, there was nothing abnormal noticed. Two days after the onset of the diarrhoea she suddenly collapsed and died. Unfortunately it was not possible to get a post-mortem, so the underlying pathology of the bleeding must remain speculative. There was no history of any gastro-duodenal trouble, recent or remote.

*Case 17.—Inoperable carcinoma cervicis uteri.*

Ma S. N., Burmese, aged 33, has had no children, no miscarriages.

*History.*—14-12-28. Abdominal section for left parovarian cyst, which was removed. The uterus, which was found retroverted and adherent, was freed and slung forward.

2-1-29. Discharged from hospital. Uterus anteverted, freely movable, and normal in size and consistency. Cervix normal. The pelvis was clear, and the abdominal wound soundly healed.

8-4-29. Patient came complaining of bleeding from the vagina of two months' duration. On examination there was an extensive cancer of the cervix, involving the whole of the vaginal vault, and the parametrium on both sides. A section of the growth taken showed it to be an *epithelioma*.

*Radium treatment.*—11-4-29. 100 mgrms. radium for 24 hours.

Total radium 2,400 milligramme-hours.

*Progress.*—For 20 days after the application of radium the vaginal discharge was profuse and offensive. It then began to get less, more serous, and less offensive. But with the improvement in the discharge, i.e., 20 days after treatment, the patient developed symptoms of dysentery, with the passage of frequent stools with mucus and tenesmus. There was no blood, and the dysenteries were excluded by bacteriological examination. The condition reacted to treatment very slowly, and did not clear up for 10 days. Apart from this the patient ran an irregular type of fever, seldom rising above 102°F., and with a rapid pulse 108/130 throughout. On the 12th May 1929 the patient left hospital despite advice, and though her cancer was smaller and cleaner, her general condition was far from satisfactory. The case could not be traced subsequently, but the rapidity and extent of her cancer hardly leaves the issue in doubt. This was the only case of cancer of the cervix occurring in a nulliparous woman which came under observation.

**Case 18.—Inoperable carcinoma cervicis uteri.**  
Ma G., Burmese, aged 50, has had 5 children, last child 8 years ago. No menopause.

**History.**—Patient came complaining of excessive loss during periods (which were stated to be regular), and also bleeding from the vagina, at odd intervals of two years' duration.

16-3-29. On examination there was an extensive cancer of the cervix involving the whole vaginal vault, and the left utero-sacral ligament.

**Radium treatment.**—19-3-29. 100 mgrms. of radium for 24 hours after a preliminary dilation and curetting. Section of a portion of the growth showed it to be an *epithelioma*.

28-3-29. 100 mgrms. radium for 24 hours.

Total radium 4,800 milligramme-hours.

**Progress.**—After the first application of radium the discharge became less, but still remained purulent, and only became slight and serous on 20-4-29. Twenty-four hours after the second application the patient developed fever which went on till the date of discharge. The fever was irregular in type, and rarely went over 101°F., and the pulse was slow throughout. A Widal's test excluded enteric. On 24-4-29, the patient was discharged at her own request. The discharge was then slight and serous, the cervix irregular and smooth in patches, but there was no bleeding and no friability. The extensions were hard, and the corpus uteri apparently normal. There was still a slight temperature.

Compared to Case 17, this patient ran a similar type of fever, but with a slow pulse throughout. There were no symptoms referable to bowel or bladder, and the patient's general condition on discharge was distinctly improved.

**Follow-up.**—This patient came to see me at Moulmein on 28-12-29. Her general health was good, but she had a sero-purulent discharge, which was not offensive. The cervix was small, hard and smooth, the vaginal vault fibrosed, and the extensions in the pelvis stony hard. She was advised to report again in 6 months' time, or earlier if the vaginal discharge got more profuse, hæmorrhagic, or offensive.

**Case 20.—Carcinomatous cervical polypus.**

Ma T., Burmese, aged 26, has had 2 children, last child 2 years ago, left mento-posterior, 15-3-27.

**History.**—11-4-29. The patient presented herself complaining of an offensive blood-stained vaginal discharge of 15 days' duration.

On examination a malignant cervical polypus was found.

12-4-29. After a dilation and curetting, the polypus was excised, with a wedge-shaped portion of the left rim of the cervix, from which it grew. The microscopical report was *epithelioma*.

**Radium treatment.**—

22-4-29. 100 mgrms. radium for 24 hours.

10-5-29. 100 mgrms. radium for 24 hours.

Total radium 4,800 milligramme-hours.

**Progress.**—It was hoped that one application of radium would be sufficient here, but 14 days after the first application, there was a friable reddish area on the anterior and left lateral aspect of the cervix, which bled to the touch.

The patient complained of excessive burning pain on micturition, after the first insertion only, which rapidly cleared up. Severe headache was a prominent feature after both applications of radium, otherwise there were no signs and symptoms noted. On discharge on 22-5-29 the patch noticed on the cervix was still present, but not friable, nor did it bleed to the touch. The corpus was anteverted and freely movable and there was no evidence of extension of cancer anywhere. There was a slight serous discharge.

**Follow-up.**—24-10-29. Cervix red and smooth. No evidence of any recurrence. The patient though young is grossly fat. There were no periods since discharge from hospital, nor were there any symptoms of an artificial menopause.

**Case 28.—Recurrent carcinoma, left breast, following operation.**

Mrs. B. A-I, aged 49, has had 1 child, last child 20 years ago.

**History.**—10-5-29. Patient came up with a lump in the left breast, of 4 months' duration. The whole of the breast was occupied by a tumour, which though freely movable on the deeper structures, had invaded the skin, giving a very classical *peau d'orange*. On 12-5-29 a radical operation for cancer was performed, but the involvement of the skin was not appreciated in the operation performed, with the result that there were evidences of recurrences along the skin wound, and along the axillary vessels 14 days after the operation. X-ray therapy was tried, but seemed to have no effect, and as the patient had two smart hæmorrhages it was abandoned.

**Radium treatment.**—Radium needles were inserted along the margins of the skin wound and then in widening circles so as to enclose the whole area of cancerous growth. Local anæsthesia only was employed, and as the patient's condition was very poor the needling was done gradually and with intervals varying 3 to 7 days.

Total radium 7,200 milligramme-hours.

**Progress.**—The cancer was in its most malignant vein, and though areas within  $\frac{1}{2}$  inch radius of the radium needles got smaller and hard, new areas of growth cropped up at various points. It was noticed early on that there were extensions to the right lung and the liver. The patient had two more hæmorrhages from the wound area, and her condition grew steadily worse. She died on 30-8-29.

Radium had practically no control over the growth in this case. Had the initial operation removed a large area of skin and an extensive amount of subcutaneous tissue, it is probable that the ultimate result would have been slightly different. The cancer according to the pathologist was a *scirrhus*.

**Case 29.—Inoperable carcinoma cervicis uteri.**

Mrs. S., Hindu, aged 50, has had 8 children, menopause 6 years ago.

**History.**—12-7-29. Patient presented herself, complaining of pain in the lower abdomen radiating down both thighs, and an offensive blood-stained vaginal discharge of 4 months' duration.

On examination there was an extensive cancer of the cervix, involving the whole vaginal vault, and extending to the parametric tissue on both sides, especially on the right. The corpus uteri was retroverted, slightly bulky, and hard. A section of the growth of the cervix showed it to be an *epithelioma*.

**Radium treatment.**—23-7-29. 100 mgrms. of radium inserted for 24 hours, after a dilation and curetting had been performed.

6-8-29. 100 mgrms. radium for 24 hours.

Total radium 4,800 milligramme-hours.

**Progress.**—This patient was an average risk. A blood picture showed:—R. B. Cs., 2,295,000. W. B. Cs., 12,000. Hb. 75 per cent. Pain was her main complaint, and it did not cease until 10 days had elapsed since the second application of radium. There was a slight rise of temperature lasting for 8 days, but only after the second application of radium. Otherwise there were no untoward signs or symptoms. On leaving hospital on 22-8-29 the patient's general condition was good. The discharge was serous and not offensive, the cervix hard, red and smooth, the corpus still retroverted, hard, and somewhat smaller. The extensions to the vaginal vault and parametrium were most marked behind and to the right, and were hard.

**Follow-up.**—The patient came up again on 22-10-29, and the condition was much the same as on discharge from hospital. There was no recurrence of the pain, and the disease seemed to be stationary. The uterus was, if anything, smaller and very hard, and the discharge was muco-purulent, small in amount, and not offensive. The patient was asked to report herself again in 3 months' time.

**Case 33.—Inoperable carcinoma cervicis uteri.**

Ma T. M., Burmese, aged 43, has had 4 children, menopause 6 months ago.

**History.**—16-10-29. Patient came complaining of an irregular blood-stained vaginal discharge of 4 months' standing, which had latterly become very offensive. On examination there was an extensive sloughing cancer of the cervix, which had invaded the vaginal vault, but had not touched the pelvis. The corpus uteri was bulky and hard. A section of the growth showed it to be an *epithelioma*.

**Radium treatment.**—21-10-29. 100 mgrms. of radium for 24 hours after a preliminary dilation and curetting.

Total radium 2,400 milligramme-hours.

**Progress.**—The patient's general condition was good. She had no untoward symptoms after the application of radium and the discharge rapidly cleared up and seemed to disappear altogether 7 days after treatment. On leaving hospital on 2-11-29 there was no discharge. The cervix was red, but irregular. There was however neither friability nor bleeding. The body of the uterus was in *statu quo*, and it is doubtful if there was any extension of cancer to it.

**Follow-up.**—On 12-12-29 the patient reported for examination. She had no complaint and her general health was good. The cervix was small, smooth, and hard, and there was slight fibrosis of the vault of the vagina. The corpus uteri was small and hard. No extensions to the pelvis could be found either on vaginal or rectal examination. In contrast to the last case, this would seem to be a cancer of a low degree of virulence, and the subsequent follow-up of the case should prove interesting.

**Case 36.**—*Fungating growth of cervix.*

Ma K. M., Burmese, aged 41, has had 1 child, 22 years ago, miscarriage 10 years ago.

**History.**—Patient came complaining of bleeding on and off for the last 18 months. Prior to that her menstrual periods were regular. A few weeks before coming to hospital, she had had a dilation and curetting done, but had no details of the operation, which had no effect on the bleeding.

14-10-29. On examination there was a fungating growth of the cervix, which was apparently localised. The corpus uteri was retroverted and bulky.

**Radium treatment.**—18-10-29. The growth of the cervix was excised, and a dilation and curetting performed: 100 mgrms. radium were inserted for 24 hours. It was noticed that the endometrium was thickened and friable, and looked like old products of conception. The pathological report of the growth, and the endometrium ran as follows:—"The section of the growth shows uterine muscle tissue undergoing hyaline degeneration. The epithelium has been destroyed, and there are one or two suspicious cell nests. The endometrium shows organised remains of old placental clot, with chorionic villi, in varying degrees of degeneration." The condition was probably an early carcinomatous polyp of the cervix, apart from the old products of conception, which were probably not malignant.

**Progress.**—The patient's general condition was poor. R. B. Cs., 1,925,000; W. B. Cs., 12,600; Hb. 45 per cent. A month after radium treatment her R. B. Cs. were 2,900,000, and Hb. 70 per cent. There was a slight serous discharge after the application of radium, which lasted for about a month and then ceased. On leaving hospital on 21-11-29 the cervix was smooth and clean, and the corpus small and hard. There was no evidence of any extension of the growth. This patient had no symptoms of any sort after her radium treatment and left the hospital in very much better health than when she came in.

**Case 37.**—*Inoperable carcinoma cervicis uteri.*

Ma O. S., Burmese, aged 46, has had 5 children, menopause 6 months ago.

**History.**—8-8-29. Patient presented herself complaining of pain in the lower abdomen, and an offensive vaginal discharge of 6 months' duration. There was a cancer of the cervix of the ulcerative type, slow growing, which had invaded the vaginal vault, and the parametric tissue on the left side. The corpus uteri was slightly enlarged and bound down to the pelvis on the left side. A section of the growth of the cervix showed it to be an *epithelioma*.

**Radium treatment.**—15-8-29. 100 mgrms. radium for 24 hours after the usual dilation and curetting.

29-8-29. 100 mgrms. radium for 24 hours.

Total radium 4,800 milligramme-hours.

**Progress.**—This patient's general condition was good all through. A blood picture on admission showed R. B. Cs., 3,150,000; W. B. Cs., 13,200; Hb. 70 per cent. The discharge became less and non-offensive 3 days after the first application of radium, but did not cease until some 3 weeks after the second application. Pain on the left side of the lower abdomen was complained of for 3 days after each application. Four days after the second application the patient developed a mild bronchitis which lasted 6 days. Otherwise there were no signs nor symptoms of any special significance. On leaving hospital on 26-10-29 the patient's general condition was good. The vaginal discharge had ceased, and there was no pain complained of. The cervix was hard, red, and smooth, the corpus retroverted, hard and fixed, and the extension of the growth on the left side was distinctly smaller, hard, and not tender. The patient was told to report in 3 months' time.

**Case 40.**—*Operable carcinoma cervicis uteri.*

Mrs. B. S., Chinese, aged 42, has had 1 child, 22 years ago.

**History.**—10-9-29. Patient came complaining of a vaginal discharge which she had had for many years, but which latterly had become much more profuse, slightly offensive, and occasionally blood-stained. Her menstrual periods were regular and lasted 4 days. The amount lost was stated to be normal, and there was no bleeding between the periods. On examination there was an early cancer of the cervix, which only involved the anterior lip, and was confined to it. A section of the growth was reported to be an *epithelioma*. The patient was however a bad surgical risk. Apart from an enlarged liver and spleen there was evidence of early fatty degeneration of the heart, and a general anæsthetic was considered inadvisable in any circumstances, local anæsthesia being employed for the course of treatment.

**Radium treatment.**—12-9-29. Four radium needles, each of 25 mgrms. R, were put into the cervical canal and left there for 12 hours.

19-9-29. The same four needles were buried in the growth of the anterior lip of the cervix and left there for 12 hours.

26-9-29. 100 mgrms. of radium were inserted into the cervical canal and uterine cavity, and left there for 24 hours.

Total radium 4,800 milligramme-hours.

**Progress.**—There were no untoward signs of symptoms in this case. The growth had almost disappeared after the second application, and a week after the third application, the anterior lip of the cervix was smooth, rounded and red, and with a small superficial slough near the external os.

**Follow-up.**—On 10-3-30, some six months after treatment, the patient's doctor sent the following report:—"The patient's general condition has improved slightly, but the enlargement of the liver still persists. The cervix uteri is small, red, smooth and hard. There is a slight serous discharge, but no evidence of a growth of any sort. The corpus is antverted and hard. Pelvis clear. Result seems excellent."

## THE DIAGNOSIS OF KALA-AZAR BY CULTURE OF THE PERIPHERAL BLOOD.

By ASSISTANT SURGEON B. M. DAS GUPTA,  
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THOUGH Mayer and Werner (1914) and Wenyon (1914) demonstrated the possibility of the diagnosis of kala-azar by culture of the peripheral blood, Row (1914) was the first to apply this measure with much greater success

in the routine diagnosis of kala-azar. His technique was as follows:—The blood, withdrawn by aspiration from a vein, is diluted with several times its volume of citrated saline solution, and then centrifuged. The deposit, which consists of red corpuscles and parasite-containing leucocytes, is then aspirated into a sterile capillary pipette and sown in the water of condensation of several tubes of N.N.N. medium, or in Row's hæmoglobin-saline medium. The tubes are incubated at 22°C.

Whilst working at the King Edward VII Memorial Pasteur Institute, Shillong, in 1922 the author was able to obtain 34 positive cultures out of 36 unselected cases of kala-azar by following Row's technique; the only modification introduced being that, instead of centrifuging the diluted blood and thus running a great risk of septic contamination, the citrated blood was allowed to stand for some time in the cool incubator until the corpuscles settled to the bottom of the tube.

In the following year a second series of 19 consecutive cases of kala-azar was examined by peripheral blood culture, and all of them gave positive results. Since that date 519 further cases have been subjected to blood culture, and a summary of the results is given in the following tables (Tables I and II).

TABLE I.

Summary of the results of culture from kala-azar patients who had had no previous antimony treatment.

Total number of cases ..	123
Number of cases proved to be kala-azar by spleen puncture, culture of spleen juice, aldehyde test, or (rarely) culture of liver juice ..	114
Number of cases positive for <i>Leishmania</i> ..	108
Number showing growth of organisms other than <i>Leishmania</i> ..	4
Number of cultures from proved cases of kala-azar which remained sterile over a period of three weeks ..	6
Period required for the appearance of flagellates in culture ..	minimum 6 days. maximum 19 days. average 11.38 days.

On 4 occasions the cultures were contaminated, chiefly by fungi, but in each of these cases the culture was repeated.

We thus see that culture of the peripheral blood in cases of kala-azar gives a positive finding in 161 out of 169 certain cases, or 95.9 per cent.

*Cultures showing the growth of organisms other than Leishmania.*

On 3 occasions cultures examined as a routine measure on the 10th day showed the growth of motile bacilli; these were identified by their sugar and agglutination reactions as *B. typhosus* and *B. paratyphosus A* respectively. On another

occasion the same culture showed the simultaneous presence of *Leishmania donovani* and *B. paratyphosus B*.

It is thus seen that organisms of the typhoid group are capable of growing upon N.N.N. medium at the low temperature of 22°C. Also *L. donovani* can grow simultaneously with these organisms. No culture should therefore be discarded as contaminated by extraneous organisms merely because bacteria are present; the bacteria should be investigated as they may belong to the enteric group of organisms.

TABLE II.

Results of cultures from kala-azar patients who had received varying amounts of antimony by injection.

Total number of cases ..	396
Number of cases proved to be kala-azar ..	215
Number of cases giving positive cultures of the peripheral blood ..	43
Number of proved cases of kala-azar which gave negative cultures of the peripheral blood ..	172
Number of cases whose cultures were negative, but in whose case it was not possible to establish the diagnosis by other tests ..	181

This table shows the immediate effect of injections of antimony compounds in driving parasites out of the peripheral circulation. Blood culture in partially treated patients is of no value in establishing the diagnosis.

Of the 43 patients who gave positive cultures, two were such remarkable cases that details with regard to them may be given.

*Case 1.*—A boy, aged 10 years, who had received several injections of sodium antimony tartrate—total quantity given not known—at Dinajpore. There being no improvement whatever, he was brought down to Calcutta, and was placed under Dr. Brahmachari at the Calcutta Medical College Hospital, where he received a full course of urea stibamine. On the day that he had his last injection to complete the course of treatment, a blood culture was taken at the request of his father, a sub-assistant surgeon employed under the District Board of Dinajpore, though the father was told that it was no use taking a peripheral blood culture at this stage. To one's surprise the culture yielded a very luxuriant culture of *Leishmania*, almost as rich as a culture from spleen juice taken from an untreated case of kala-azar. The boy died a few days later.

*Case 2.*—A Hindu gentleman, aged about 50 years, a graduate of the Calcutta Medical College, who had received injections of both sodium and potassium antimony tartrate, amounting in all to 4.5 grammes, at regular intervals of 2 days, beginning with 1 c.c. of a 2 per cent. solution, and increased to 5 c.c. of the same strength. As he showed no improvement clinically spleen puncture was suggested by the physician in charge, and also by Col. Mackie, I.M.S., who saw the patient in consultation. The patient, however, refused to undergo this small operation.

Blood culture was taken within a week of the termination of antimony injections, and was positive. In those days, the use of organic preparations in the treatment of kala-azar had not been introduced, so a further course of injections of sodium antimony tartrate was commenced, but the patient died.

Of the 43 positive cultures, 32 were from definite cases of relapse, and the remaining 9 cases had received no antimony injections for 3 weeks before the cultures were taken.

To assess the value of culture of the peripheral blood in partially treated cases, cultures were taken from 26 patients who had had some antimony treatment—the diagnosis of kala-azar having been proved in all cases by other methods of diagnosis. Of these, the first group of 10 had received only 1 injection; the second group of 10 had had 2 injections each; and the remaining 6 had had 3 injections of urea stibamine; corresponding respectively to amounts of 0.1, 0.25, and 0.45 gramme. Of these 26 cases, only 1 of the first group gave a positive culture; all the others were negative. The cultures were in each instance taken about 48 hours after the last antimony injection.

#### FACTORS INFLUENCING THE GROWTH OF LEISHMANIA IN CULTURE.

##### 1. Temperature of incubation.

The cultures are usually placed within half an hour of taking them in the cool incubator at 22°C. On two occasions in the month of September, however, when the average daily temperature varies from 27 to 34°C., cultures were received from mofussil stations, and were placed in the cool incubator about 7 hours after being taken. In a third case the citrated blood was placed in the warm incubator at 37°C. by mistake by a laboratory assistant, and left there for 12 hours. In all three instances, *Leishmania* grew well in the N.N.N. medium when placed at the proper temperature.

In order to ascertain whether *Leishmania* will always remain viable in the citrated blood for 12 hours or so in the warm incubator at 37°C., citrated blood from 8 positive cases was kept in the warm incubator for 12 to 18 hours, and then removed to the cool incubator after culture. Growth took place in one tube only.

##### 2. Media.

Row (1912) has advocated his hæmoglobin-saline medium for culture of *Leishmania*. We have tried this medium on a fairly extensive scale, but have abandoned it as we have always found the results inferior to those with the classical N.N.N. medium. Shortt's modification of N.N.N. medium with glucose added to it was also tried, but we found that the original N.N.N. medium, which is less complicated to prepare, was in no way less satisfactory. For the primary culture and demonstration of the parasites, we have not yet found any medium to be an improvement on the original N.N.N. method.

##### 3. Effect of treatment.

It has been found almost invariably that cultures taken after the first injection of antimony—and especially so with the organic compounds of antimony—remain sterile. This method of diagnosis is therefore not to be relied upon in partially treated patients. Also—as has been pointed out by Shortt (1927)—a

negative culture from the peripheral blood cannot be relied upon as a test of cure.

##### 4. Stage of the disease.

Growth takes place equally well in both early and advanced cases of kala-azar, though in the former it takes place more slowly, taking some 12 days or so before the flagellates appear.

##### Conclusions.

1. In proved cases of untreated kala-azar, culture of the peripheral blood yields positive results in 95.9 per cent. of cases.

2. The average number of days for the appearance of flagellates in the culture was 11.4 days—minimum and maximum being 6 and 19 days respectively.

3. Although the optimum temperature for the growth of *Leishmania donovani* is 22°C., or thereabouts, the parasites have been found on rare occasions to remain viable in citrated saline at 37°C. for more than 12 hours.

4. Blood inhabiting organisms of the typhoid group can grow on N.N.N. medium at a temperature of 22°C.; and both *Leishmania donovani* and *B. paratyphosus B* can grow together at that temperature in the same tube.

5. In most cases, after the first injection of antimony, the parasites disappear from the peripheral circulation, or undergo such changes that they do not grow in N.N.N. medium. Culture of the peripheral blood with negative results, therefore, cannot be taken as a criterion for cure.

My grateful thanks are due to Lieut.-Col. R. Knowles, I.M.S., my chief, for his kind help in preparing this note.

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MALARIA AT KAPURTHALA DISPENSARY, LUCKNOW.

By C. D. CHATTERJI, B.Sc., M.B., B.S.

THE Kapurthala Dispensary is situated on the outskirts of Lucknow, and patients attend the dispensary not only from the interior of the town but also from outside the city. The popularity of the dispensary is rapidly increasing, and it offers a good field for study, but unfortunately there is no equipment for

pathological studies. Hence my observations have been confined to statistical and therapeutical study.

The accompanying tables and graphs have been drawn up to show the number of cases of malaria treated annually at this dispensary for the years 1927 to 1929 inclusive. A glance at Table I shows the following features:—

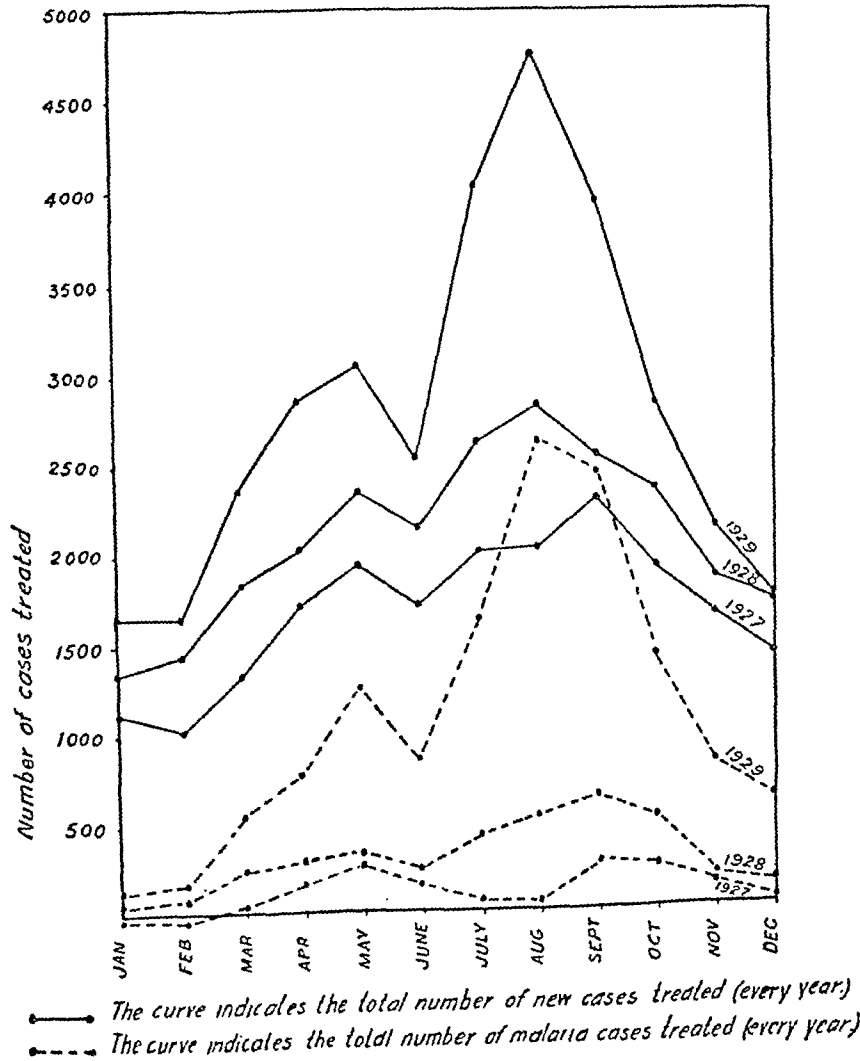
- (i) Children are more affected with malaria than are adults.
- (ii) Female children are more affected with malaria than male children.
- (iii) In adults, males are slightly more affected than females.

To a certain extent these facts may be accounted for by the following reasons:—

TABLE I.  
*Showing the incidence of malaria with age and sex.*

Number of malaria cases.	ADULTS.			CHILDREN.		
	Total.	Male.	Female.	Total.	Male.	Female
1,000	418	210	218	582	289	293

GRAPH 1.  
*Showing the number of malaria cases and the total number of new cases treated in the Kapurthala Dispensary, Lucknow, from 1927 to 1929.*



(i) Children are generally more exposed to mosquito bites than adults, and especially so in villages, where they have little or no clothing.

(ii) Female children are less taken care of in India, especially amongst the uneducated classes.

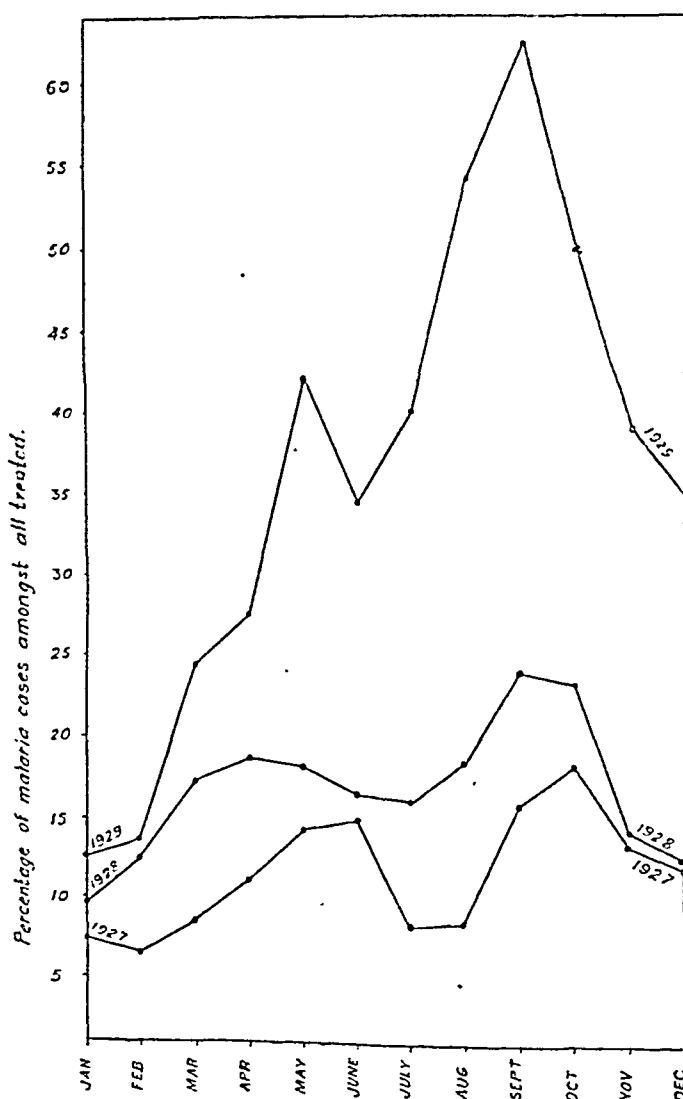
(iii) Among adults, males—especially in villages—are more exposed to mosquito bites than females, owing to the nature of their duties.

in 1928 where the peak for total attendance was in August, and that for malaria cases seen in September.

A more correct study of the malarial incidence however is seen in Graph 2, which shows the percentage of the malaria to the total cases seen for the years 1927—1929. In 1927 this percentage shows a slight decline up to February, then rises to June, declines in July and August, then rises to its maximum incidence in October, and then declines again till the end

GRAPH 2.

*Showing percentage of malaria cases treated in the Kapurthala Dispensary, Lucknow, from 1927 to 1929.*



A study of Graph 1 shows the following findings:—

(i) For each year, 1927, 1928, 1929, there are two peaks in the attendance for malaria in each year.

(ii) The curves for malaria cases treated are parallel to the curves for general attendance of new cases of all sorts treated, except

of the year. It will be noted that February is the month of lowest incidence.

The curve for 1928 follows a somewhat different course. There is a steady increase from the very beginning of the year—with no drop in February—and a peak in April; then a slow decrease till July; thereafter a more abrupt rise until the maximum is reached in

TABLE II.

*Showing the treatment of malaria cases and the by-effects noted.*

Treatment.	Number of cases.	Cerebral symptoms. (Fullness in head, headache, dizziness.)	Deafness.	Diminished vision.	Gastric symptoms. (Vomiting, etc.)	Intestinal symptoms. (Diarrhea, etc.)	Urticarial skin eruptions.	Epistaxis.	Hæmoptysis.	Cardiac and respiratory depression.
Quinine mixture. (Containing gr. v. quinine sulph. thrice a day.)	1,000	781	698	2	218	112	4	3	1	1
Cinchona mixture. (Containing gr. v. cinchona febrifuge thrice a day.)	1,000	972	799	10	694	763	1	2	..	6
Powders containing gr. v. cinchona febrifuge with gr. v. sodii bicarb. thrice a day.	1,000	866	693	..	310	684	1	..	..	3

September—and not October, as in 1927. The lowest point was in January.

The curve for 1929 is the most interesting of the three. From February to May there is an abrupt increase, followed by a drop in June. In September malaria cases constituted 62.5 per cent. of all cases seen, and even in December remained as high as 35.4 per cent. of the total attendance. There is no doubt that Lucknow and its environs are becoming more and more malarious, and epidemic conditions may become established unless proper measures are taken.

Table II shows the general symptoms noted and the methods of treatment adopted. There were a few additional cases whose temperature came down only after intravenous injections of quinine hydrochloride. In the early part of the epidemic in 1929 quinine mixture alone was used; later, when the supply of quinine ran short, cinchona febrifuge mixture was issued; this however was badly tolerated by the patients, and was positively harmful to many. Until supplies of quinine were renewed, therefore, I replaced the cinchona febrifuge mixture by powders containing equal amounts of cinchona febrifuge and sodium bicarbonate. This was not only better tolerated than the cinchona febrifuge mixture, but was especially appreciated by the poorer classes who had not enough money to buy the bottle of medicine which they required. A study of Table II will show the merits and demerits of the three methods of treatment adopted, but it is to be noted that the quinine mixture brought about a more rapid recovery than the cinchona mixture or the cinchona powders.

A characteristic feature of the 1929 outbreak was that villagers as a rule took longer to get rid of their malaria than the more educated patients from the city. This may be explained by two facts: (i) villagers come for medical aid only when they have been ill for some time,

and (ii) they are naturally more exposed to re-infection from mosquito bites.

#### THE DIFFERENTIAL DIAGNOSIS OF CHOLERA AND FOOD POISONING.

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As fatal cases of cholera occurring amongst Europeans in India are often euphemistically attributed to "ptomaine poisoning," notwithstanding the fact that no bacteriologically attested outbreak of food infection, so far as the writer is aware, has ever been recorded in India, it will be profitable to consider the differential diagnosis of these two apparently similar conditions.

The term "ptomaine poisoning" is a misnomer and should therefore be discarded. The word *ptomaine* which is derived from the Greek word *ptoma*, a corpse, was originally coined in 1870 to describe the products of protein decomposition. Some of these products, though by no means all of them, when injected parenterally into laboratory animals were found to be poisonous. Subsequent research however showed that although this was the case, none of these products were actively poisonous when taken by the mouth, and that even those that were active did not produce intestinal colic, vomiting and diarrhoea—the common syndrome of food poisoning. The term "food poisoning" or preferably "food infection" should therefore be substituted for the popular and wholly inaccurate term "ptomaine poisoning," since it is not decomposed food but food infected with certain pathogenic organisms which gives rise to outbreaks of so-called food poisoning. Infected food does not differ from uninfected food in either appearance, taste or smell.

The organisms responsible for the outbreaks of food poisoning which have been bacteriologically verified in Europe, belong to the

Salmonella group of bacteria and include the *B. enteritidis* of Gærtner and *B. artrycke*.

*B. artrycke* is very closely related to *B. paratyphosus B* and can only be differentiated from it by the absorption test.

These organisms in cases of food poisoning are found chiefly in beef and pork, particularly in "made-up" dishes such as brawn, sausages and pies. They are also found in the milk of diseased cattle. Mutton and fish are seldom infected. Other foods such as fruit and vegetables become infected indirectly. Rats and mice are natural carriers of the Salmonella group of bacteria and food may be infected by their faeces.

Owing to the very short latent period in many outbreaks of food poisoning, it has been concluded that the causative organisms may form toxins in the infected food. Such toxins however have never been isolated. Filtrates of these organisms are toxic when injected parenterally into laboratory animals but cause no symptoms when given by the mouth. Infected food can be boiled for an hour or more without impairment of its toxicity. The exact way in which the Salmonella group of bacteria produce their irritant effects on the human intestine is at present unknown.

The differential diagnosis of cholera and food poisoning by bacteriological investigation being out of the question in most cases in India, we shall consider the clinical symptoms of these two conditions in detail.

In the great majority of instances, an attack of cholera begins as a painless diarrhœa, without nausea or physical discomfort of any kind, in fact one of the outstanding characteristics of cholera is the general absence of pain, with the exception of that associated in the later stage of some cases with muscular cramps. The textbooks fail to lay adequate stress on this very striking phenomenon. The stools which are at first fœcal, soon become watery and copious in character, white shreds of denuded intestinal epithelium being passed from the bowel along with the colourless fluid. The stools at this stage are described as "rice-watery" from their resemblance to water in which rice has been boiled—water in which rice has been boiled containing numerous white flakes of rice in suspension. After a certain interval corresponding with the onset of the watery evacuations from the bowel, vomiting supervenes. As soon as the stomach has emptied itself of its original contents, the vomiting becomes watery, copious and projectile, considerable quantities of fluid being frequently evacuated per os. The vomiting in cholera is unaccompanied by nausea, retching or distress. Intestinal pain and discomfort are usually absent, and where present are generally mild in character. Acute abdominal pain is extremely rare and is associated in a considerable percentage of cases with pink blood-stained

stools, which, contrary to what might be anticipated, are of very favourable prognostic import. Tenesmus is absent, the stools as a rule being passed involuntarily. Owing to the dehydration of the body through the copious watery evacuations, muscular cramps, collapse and suppression of urine, all in time supervene. The voice becomes husky and whispering and the features shrivelled. The axillary temperature falls below normal. The breath is cold. The mortality in cholera is very high, being 90 per cent. in untreated cases.

The clinical picture in food poisoning is strikingly different. An attack of food poisoning generally begins with acute abdominal pain, accompanied by headache and a rise of temperature (99—102°F.). In severe cases a sensation of chilliness may also be present. After some time violent vomiting and retching set in, followed, or in some cases accompanied by, diarrhœa and tenesmus. This syndrome of symptoms in food poisoning—acute abdominal pain, violent vomiting and retching with diarrhœa and tenesmus—generally in the order named, is very constant and characteristic. The stools are usually offensive and though fluid, remain fœcal or bilious in character, never becoming colourless or "rice-watery." Prostration and muscular weakness are common, but there is no collapse from loss of fluid, though in severe cases, owing to toxæmia, there may be faintness or syncope with temporary disappearance of the pulse at the wrist.

Suppression of urine never occurs nor does the voice become whispering or the features shrunk. Muscular cramps of a mild nature are sometimes found in very severe cases together with tingling or numbness of the extremities. The mortality is low, ranging from one to two per cent. Death when it occurs is due to toxæmia and exhaustion from intractable retching, which is constantly present in fatal cases.

For convenience sake the differential diagnosis of these two conditions is given in tabular form below:—

Symptoms.	Cholera.	Food poisoning.
Diarrhœa ..	Painless. Precedes vomiting.	Associated with severe intestinal pain. Generally follows vomiting.
Vomiting ..	Causes no distress. Watery, copious and projectile. Follows diarrhœa.	Often violent and distressing. Vomit consists of food, and is never watery, copious or projectile. Generally precedes diarrhœa.
Nausea ..	Absent	Constant.
Retching ..	Rare	Constant, often severe.

Symptoms.	Cholera.	Food poisoning.
Acute abdominal pain.	Rare ..	Constant.
Tenesmus ..	Absent ..	Common.
Stools ..	"Rice-watery" and copious.	Liquid but faecal and offensive. Never colourless or copious.
Urine ..	Complete suppression.	Never suppressed.
Muscular cramps.	Constant. The severity depending on the amount of fluid lost from the tissues.	Present only in very severe cases. Often associated with tingling and numbness. Mild and confined to the extremities.
Collapse ..	Frequent. Chiefly from loss of fluid.	Never from loss of fluid. In severe cases faintness or syncope may occur from toxæmia.
Fever ..	Surface temperature below normal.	Axillary temperature 99—102°F. Accompanied by shivering in severe cases.
Headache ..	Absent ..	Frequent.

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## AN EXPERIMENTAL STUDY OF HOST SUSCEPTIBILITY TO CHOLERA.

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SEVERAL workers in this laboratory have been investigating the general problem of host susceptibility to disease. The body is enclosed in an epithelial covering layer. The anatomical structure of this layer varies a great deal. The skin, the upper and lower respiratory tract, the alimentary tube, and the urinary tract are continuous body-covering layers. The causative agent of disease must be able to maintain itself upon and in contact with a body surface-covering layer; penetrate or invade the host

and then colonize or live as a parasite within the host. The resulting abnormal physiological and anatomical changes characterize the particular disease process. We have devoted most of our attention for a number of years to the beginning of this chain of events, namely, to the reason why foreign or exogenous bacteria are able to survive upon the body-covering layer of the host. Most investigators have devoted their attention to the actual disease process itself. Bacteria have been injected into animals in varying amounts and the results have been recorded. The anatomical changes have been studied even more than the physiological alterations. It occurred to us that this method of attack omitted the most important link in the epidemiological chain of evidence. When two or more people come in contact with a disease-producing microbe in the same concentration and one person becomes ill, we ordinarily explain this by assuming an increased susceptibility of that particular person. The literature is full of vague references to "decreased resistance," "lowered resistance," "increased susceptibility," etc.

Some of our work has been reviewed in relation to the problem mentioned above (Arnold, 1929). A note was published upon the possibility of certain aspects of this problem in relation to cholera (Arnold, 1927). The mucosa of the alimentary tract has the power of regulating the bacterial life that exists within the lumen and in contact with this body surface in the normal individual. Foreign bacteria injected are destroyed. The bacterial population inhabiting the incubated semi-fluid or solid contents of the digestive apparatus are under the control of the mucosa. Certain environmental changes will allow ingested bacteria to remain viable within the lumen of the intestinal tract for hours or days. The loss of the self-disinfecting power of the alimentary canal is closely associated with the entrance of bacteria into the body of the host. The gastro-intestinal tract is not the only body surface that possesses the power of destroying foreign strains of bacteria. Arnold, Ostrum and Singer (1928) have shown that the mucosa of the nose has the same self-disinfective power. Arnold, Gustafson, Hull, Montgomery and Singer (1930) have studied the self-disinfecting power of the skin. The body surfaces so far investigated by us show that they possess the power to regulate the bacterial flora in contact with the epithelial covering.

The contents of the lumen of the upper half of the small intestine are slightly acid in reaction. This segment of the small intestine is almost free from bacteria in the normal animal. Bacteria placed in this part of the small intestine, either by oral ingestion or by injecting directly into the lumen, are rapidly destroyed. The slightly acid reaction of itself does not play a

role in the destruction of bacteria. We have concluded that this is the proper acid-base balance for the material within the lumen of the upper half of the small intestinal tract in the normal animal. An alkaline reaction within this zone indicates an abnormal animal. Under these conditions bacteria are not destroyed, and the mixed faecal bacterial flora from the large intestine ascend into the upper levels of the small intestine. Arnold (1929) has reported the experimental evidence upon the self-disinfecting mechanism of the gastro-intestinal tract.

The purpose of this communication is to submit further experimental evidence upon the importance of changes within the host that may play a significant rôle in the cholera problem.

*V. cholera* fed by the mouth to rabbits does not cause diarrhoea. Intravenous injections of the proper amounts cause a cholera-like diarrhoea followed by death of the rabbit. The *V. cholera* can be isolated with ease from the fluid faeces, also from the lumen of the gastro-intestinal tract, heart blood and various organs after death. The duodenum was exposed in rabbits under ether anaesthetic, using aseptic surgical methods. Three times the lethal intravenous dose of *V. cholera* suspended in saline was injected into the lumen of the duodenum. The abdomen was then closed and the animal placed in an observation cage. No diarrhoea or other abnormal symptoms developed. The same experiment was repeated, one half of the rabbits were injected with saline suspensions and one half with alkaline buffered phosphate suspensions (1/15 Mol. disodium phosphate) of *V. cholera*. All of the rabbits receiving the intraduodenal alkaline solution developed diarrhoea and four of the six died within forty-eight hours. The bacteriological and pathological findings were the same as in those dying after intravenous injections. The same experiment was repeated again, twelve rabbits being used in this series. The saline suspensions remained normal, all six of the alkaline phosphate suspensions developed diarrhoea, three died within forty-eight hours, one after seventy-two hours, one after ninety-six hours, and one recovered.

One half of the lethal dose of *V. cholera* (24-hour broth culture) injected intravenously does not cause diarrhoea or any other noticeable abnormal symptoms in rabbits. When saline alone is injected into the duodenum (using the same operative procedures as mentioned above) at the time of the intravenous injection of one half of the toxic dose, no abnormal symptoms develop. When alkaline buffered phosphates are injected intraduodenally at the time the *V. cholera* are injected intravenously, diarrhoea develops in all of the animals and eight of twelve died. The bacteriological and pathological findings were the same as those encountered in animals dying after

intravenous injection of twice the amount of the *V. cholera* culture.

We next varied the time interval after the intravenous injection of sublethal doses of *V. cholera* before the intraduodenal injections of sterile saline and sterile alkaline phosphate solution were given. The time interval varied from 3 to 96 hours. None of the rabbits injected intraduodenally with saline developed diarrhoea, all remained normal in every respect. The animals injected intraduodenally with sterile alkaline phosphate solutions 3, 6, 9, 12 and 18 hours after the intravenous injection of sublethal doses of *V. cholera* died of diarrhoea. The faeces and the contents of the intestinal tract contained the *V. cholera* in almost pure culture. When the time interval was extended to 24 hours, only about half of the rabbits receiving the alkaline phosphate intraduodenally developed diarrhoea and died. After a time interval of more than 24 hours, none of the animals were affected by alkalinizing the upper portion of the small intestine.

During the usual processes of adaptation to environment, the animal or human host that had an acid-base balance within the lumen of the upper part of the intestinal tract comparable to that in the experiment we have just performed, would be in a state of acute or chronic maladjustment to its environment. The acute reactions have been studied by us in relation to hot and humid rooms, food-poisoning outbreaks, foreign-protein injection, acute respiratory diseases, etc., and similar reactions that involved sudden and extensive intoxications of the experimental animal (Arnold, 1929). There are several students investigating chronic maladjustment mechanisms in our laboratory at the present time, such as avitaminosis (A, B, C and D vitamins). We have been able to extend the excellent work recorded by McCarrison in gastro-intestinal dysfunction in deficiency diseases of various kinds. These results have not yet been reported, but we think that the intra-intestinal changes can be determined before there are abnormal physiological manifestations of avitaminosis. The contents of the duodenum and jejunum became more alkaline, the faecal bacterial flora from the lower intestinal levels ascend into this region, and the ingested bacteria are not destroyed.

Under-nourishment in our animals causes a change in the biological function of the intestinal mucosa. These animals are more susceptible to climatic changes than an animal in a good state of nutrition. The balance between the animal or the human and the outside world is of prime importance in maintaining health. We have found one of the earliest demonstrable changes to take place is an alteration in the biological function of the body surface lining the lumen of the alimentary tract. The contents of this tube are in reality outside the body. Foods and fluids ingested are retained



for certain periods of time in the stomach. After acidification the gastric contents enter the small intestine. Alkaline digestive juices are secreted into the lumen of this part of the tract. Hydrolysis and absorption rapidly take place. When these processes pursue their usual involuntary or automatic course, there is a definite relationship established between the acid and base substances. This indicates a normal reaction of the material in contact with this part of the body surface. Alteration in the acid-base balance indicates abnormality. In our experience this is an index of maladjustment. The loss of the ability of this body surface to control the bacterial life in contact with it, is another index of changed biological function. We have been able to show experimentally in this brief report that a change in the reaction of the contents of the upper part of the small intestine from a slightly acid to an alkaline reaction is accompanied by a change in the susceptibility of the animal to *V. cholerae* infections.

The *V. cholerae* used in these experiments has been constant. The rabbit has been changed from a resistant to a susceptible experimental animal by changing the reaction of the material within the lumen of the duodenum and jejunum. The influence of diet upon health is becoming so well known that mention only needs to be made of this important subject. A population in a poor state of nutrition will be made more abnormal by climatic changes than they would be if their metabolic functions were normal. These changes in the population can play an important rôle in the epidemics of cholera in India. The equilibrium between the host and the *V. cholerae* will be disturbed to the advantage of the parasite and the detriment of the host, if the latter loses the power of disinfecting its body surface covering the alimentary canal.

#### Summary.

1. *V. cholerae* injected into the duodenum of rabbits in saline does not cause diarrhoea. Such animals remain healthy.

2. *V. cholerae* injected into the duodenum of rabbits in alkaline buffered phosphate solutions cause diarrhoea and death. The *V. cholerae* can be isolated from the intestinal tract and various organs of the animals.

3. One half of the minimal lethal dose of *V. cholerae* injected intravenously in rabbits does not cause diarrhoea.

4. One half of the minimal lethal dose of *V. cholerae* injected intravenously in rabbits and followed by an intraduodenal injection of sterile saline does not cause diarrhoea.

5. The same dose of *V. cholerae* intravenously followed by intraduodenal injection of sterile alkaline buffered phosphate solution causes diarrhoea and death in rabbits. The *V. cholerae* can be isolated from the faeces before

death, from the intestinal tract and various internal organs after death.

6. If sterile alkaline phosphate solution is injected into the duodenum up to 18 hours after one half of the lethal intravenous dose of *V. cholerae* has been injected, the rabbits develop diarrhoea and die after 24 to 48 hours. The *V. cholerae* can be isolated from the various organs after death.

7. Host susceptibility to *V. cholerae* infection has been changed or modified in these experiments by changing the reaction of the upper part of the intestinal tract.

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#### INTRAVENOUS CALCIUM CHLORIDE IN THE TREATMENT OF CHOLERA.

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LOOKING to the morbid anatomy and blood changes in cholera, one finds that the coagulability of the blood is diminished, there are extensive hæmorrhages into the tissues of the kidneys—especially in the cortex after suppression of urine, and petechial hæmorrhages in the stomach and visceral pericardium. It was these indications which, I believe, led Sir Leonard Rogers to use calcium chloride as one of the ingredients of his hypertonic saline solution. His solution contains 4 grains of calcium chloride and 120 grains of sodium chloride to the pint.

It seemed to me that the former dose was too small and the latter too large. Even if 4 pints be given, this contains only 12 grains of calcium chloride; in my experience it is always best to stop the transfusion when rigor occurs, and in many late and severe cases one cannot introduce as much as 4 pints before rigor sets in. Accordingly, last year I increased the proportion of calcium chloride by 1 to 2 grains to the pint, and found the results most gratifying in many respects. In 1927, 1928, and the first two months of 1929, I treated cases according to Sir L. Rogers' method; but during the last two months of 1929 by increased doses of calcium chloride without alkalies. This year (1930) I have kept up the increased dose of calcium chloride in the hypertonic saline infusion, combining it with separate transfusions of sodium bicarbonate, 160 grs. to

the pint of normal saline. The results are shown in Table I.

neglected. A cure rate of 77.8 per cent., effected by increasing the strength of calcium

TABLE I.

*Results with different forms of treatment of cholera in the collapse stage by the intravenous method.*

Period.		Treatment.	Cases.	Deaths.	PERCENTAGE OF	
					Deaths.	Recoveries.
A.	1927, 1928, and first 2 months of 1929.	Hypertonic saline, CaCl <sub>2</sub> gr. 4 to pint.	38	13	34.2	65.8
B.	Last 10 months of 1929	Hypertonic saline, CaCl <sub>2</sub> gr. 5 or 6 to pint.	28	5	17.8	82.2
C.	First 20 days of 1930 epidemic.	Hypertonic saline, CaCl <sub>2</sub> gr. 5 or 6 to pint, with sod. chloride gr. 105. Also sod. bicarbonate gr. 160 to the pint separately.	18	4	22.2	77.8

The figures given in Table I refer only to patients admitted in the stage of collapse and in urgent need of transfusion, the pulse at the wrist being either very feeble or imperceptible.

A study of Table I might make it appear that the second line of treatment gave the best results, but the cases treated in the early part of 1930 were the very worst that I have ever come across in my 18 years of practice, and in at least 700 cases of cholera seen. I am not sanguine about the efficacy of the increased calcium chloride treatment alone in old persons over 50. Six out of the 18 cases treated this year with treatment C were more than 50 years of age, and only one died—a very successful result for the onset of epidemic conditions.

Other advantages in increasing the amount of calcium chloride which I have found are:—  
(i) rectal salines are not so frequently needed to stimulate the kidneys; in the severest cases rectal salines every 6 hours for one day are sufficient, including cold salines for controlling pyrexia. (ii) Vaso-constricting drugs are required with much less frequency. (iii) Excepting in the most severe cases, only one intravenous saline transfusion is required; at the most a subcutaneous hypertonic saline is sufficient to make up for the deficiency in fluids.

Rogers states that with the addition of the oxidising drug, 68 per cent. of 69 transfusion cases were saved, and in patients in whom no pulse could be felt at the wrist, or where the blood pressure was too low to be measured at the wrist, no less than 58 per cent. were rescued from certain death, during 12 months. Adding the 7.5 per cent. extra gained by him by the introduction of alkaline treatment, the success rate is 65.5 per cent. or even 75.5 per cent. under epidemic conditions when dealing with severe cases. The mortality is high at the commencement of an epidemic and then progressively decreases, so that drugs found useful in the early stage of an epidemic cannot be

chloride, among the first cases in the epidemic of April 1930 is therefore satisfactory enough to be given further trial.

*Technique.*—My technique is as follows:—

The solution consists of calcium chloride 5 or 6 grains, sodium chloride 120 grains, to the pint; and two pints are rapidly introduced, followed slowly by alkaline normal saline—sodium bicarbonate 160 grains, sodium chloride 60 grains, to the pint. One pint or as much as possible of the calcium chloride-increased solution is then introduced again before rigor sets in. Pituitrin 1 c.c. and digitaline and atropine gr. 1/100th are injected subcutaneously after the first transfusion. Calcium permanganate drink, gr. 1 to the pint, is given in small quantities as often as necessary. After the febrile reaction is controlled, if the patient's pulse gets feeble, the specific gravity of the blood is observed, and if it is found to be high, the transfusions are repeated in the following order:—(i) one pint of hypertonic saline containing increased calcium chloride; (ii) alkaline normal saline; (iii) hypertonic increased-calcium chloride saline again; until the specific gravity of the blood has been restored to normal.

It is premature to come to final conclusions on 18 cases observed, but the indications all seem to point to the necessity for an increase in the calcium chloride content of the injection. It is needless to add that successful results can only be achieved by the closest and most patient personal attention by the physician himself, with the help of subordinates who must be honest workers.

*Conclusion.*—Of the three lines of treatment shown in Table I, the third appears to be the best method for severe cases of cholera asiatica.

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## THE PROGNOSTIC IMPORTANCE OF THE WIDAL REACTION IN TYPHOID FEVER.

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It is well known that Widal's agglutination test has a twofold importance in cases of typhoid fever, (i) from the point of view of diagnosis, and (ii) from the point of view of prognosis.

In our every-day practice we sometimes come across cases which are clinically true cases of typhoid fever, but in which curiously enough the Widal reaction remains completely negative during the whole course of the disease, and some of these cases recover. My object in writing this note is to discuss these aberrant negative results in the Widal reaction.

In some patients the Widal reaction has been observed to be positive in as high a titre as 1:50,000, and in some of these cases, though the prognosis appeared to be quite hopeful, yet we have had the sad experience of meeting with disastrous complications such as severe diarrhoea, intestinal hæmorrhage, grave lung complications, and the like. This very high and rising positive result was sometimes, though not in all cases, heralded by some on-coming serious complication. Yet ordinarily one would take a positive Widal reaction at a very high dilution to indicate strong body resistance by the patient. The cases on the other hand which gave a negative Widal reaction throughout were generally the worst.

Recently an adult female patient was admitted to our wards with a history of continuous fever for 14 days. The case was diagnosed clinically as one of enteric fever, and on the 26th day of illness the patient had profuse intestinal hæmorrhage for a whole 48 hours. She passed over the crisis and became convalescent on the 46th day. During the whole period of the disease the Widal reactions were repeatedly negative, though there was no doubt as to the case being one of typical enteric fever. The patient now remained quite well for 16 days. From the 17th day of convalescence, however, she began to get a slow rise of temperature with a typical step-ladder chart, and the whole course of the disease was repeated. This time the temperature became normal on the 32nd day. During this relapse period, the Widal reaction was positive in a dilution of 1:500. This case illustrates very well the prognostic importance of the Widal reaction.

In other cases one has observed the Widal reaction to fall from being positive in a very high dilution to a negative result just before some fatal complication. In brief, a very high and positive, rising, reaction is sometimes just as bad from the point of view of prognosis as a negative reaction.

## THE ISOLATION OF ATOXIC STRAINS OF *BACILLUS TETANI* IN EGYPT.

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Professor,  
and

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Demonstrator.

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WHILE investigating the *Bacillus welchii* content of the stools of Egyptians we observed that a very large number of samples of faeces grown in Robertson's bullock heart medium produced terminal drumstick spore-bearing bacilli morphologically resembling *Clostridium tetani*.

Accurate figures concerning the incidence of clinical tetanus in Egypt are not available. For the past decade in Kasr el Ainy Hospital (800 beds; outpatient weekly attendance over 10,000) an average annual death rate of 7 from tetanus in 1,200 from all causes is estimated. In a country like Egypt where the fellah is a true son of the soil this incidence would appear to be a low one.

Tenbroeck and Bauer(1) found that 34 per cent. of the stools of 78 individuals in Peking yielded *Bacillus tetani*, and in a subsequent paper(2) that individuals carrying the bacilli had an appreciable amount of antitoxin in their blood sera. Their impression was that clinical tetanus was relatively uncommon in that area. Bauer and Meyer(3) in California found

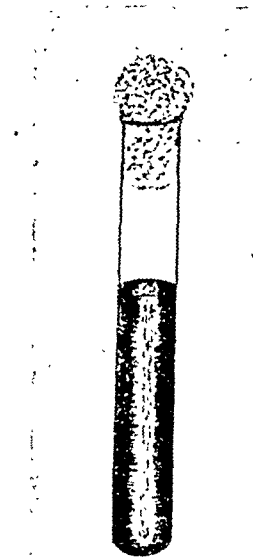


Fig. 1.—Agar stab culture.

*B. tetani* in 24 per cent. of cases investigated, at the same time finding no atoxic strains. In California the incidence of the disease is fairly high. Fildes(4) isolated it in only 1 per cent. of cases examined, while Tulloch(5) found it in 16 per cent. of cases drawn from a civilian

population. Kerrin(6) in Aberdeenshire examined 204 cases without finding *B. tetani* although he states that 36 of these showed organisms morphologically suggesting *B. tetani*, but in no case was it obtained either by repeated plating out or by the method of Fildes.

These workers have used different methods of isolation, and it is possible this may have something to do with the different findings. This paper is concerned more in the description of a large number of strains of what appears to be *B. tetani* of the atoxic variety occurring in the faeces of the fellahs.

These strains have all been isolated by the following technique:—

A tube of Robertson's medium, pH distinctly alkaline to litmus, is inoculated with a bean-sized sample of faeces from the patient in the ward. This is then heated between 75° and 80°C. for 20 minutes, corked, and incubated aerobically for 7 days. Routine examination by staining shows that four out of five cultures usually contain bacilli with spherical terminal spores resembling *B. tetani*. A few drops of this fluid are transferred by sterile pipette to the condensation water of a Fildes' slope and examined after 48 hours' incubation in a



Fig. 2.—Surface colonies.

McIntosh and Fildes' jar (Wilson modification). Usually two or three will show the film and filamentous edge diagnostic of *B. tetani* (Fildes). If incubation be continued to the fourth day terminal drumsticks usually appear. From the filamentous edge another slope is inoculated and also a melted Fildes' agar Petri dish. In the latter typical cotton-wool colonies appear and we have found it relatively easy to obtain these in pure culture. Colonies are picked and sown in Parke and Williams' broth and incubated anaerobically for 48 hours for examination for motility and agglutination tests, and for longer periods up to 14 days for the development of toxin.

As an alternative method for the isolation of these bacilli in pure colony culture we have found the following most successful:—

1 c.c. of the Robertson fluid containing round terminal spores is pipetted to a test tube containing 1 c.c. of 1 per cent. phenol. This is

left overnight in the incubator and next morning it is used to inoculate melted and poured Fildes' medium in a Petri dish. Incubation in a Fildes' jar, using aqueous vapour instead of hydrogen in the manner recently described by Herrington and Knaysi(7), results in the production of well isolated typical colonies. The use of aqueous vapour instead of hydrogen greatly simplifies matters, although the rate of

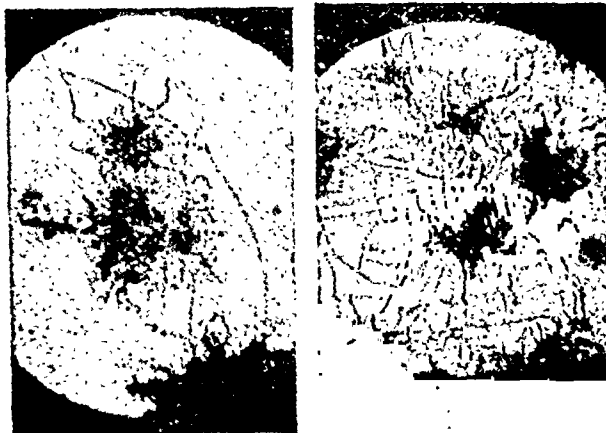


Fig. 3.—Photomicrographs. Deep colonies.

growth of the colonies by this method is slower; if the Petri dishes are wrapped in oil cloth or gutta-percha tissue there is no fear of flooding the dishes.

The characters of ten of these atoxic strains isolated by the first described technique is as follows:—

#### MORPHOLOGY, CULTIVATION AND BIOCHEMISTRY.

1. *Broth* (Parke Williams).—Slight milky turbidity after 24 hours, motility sluggish though definite; the culture can be used for the purposes of agglutination and the fourth day growth for the presence of toxin; morphologically the bacilli are from 2 $\mu$  upwards to filamentous forms, and have rounded ends; it is essentially a slender bacillus resembling *B. Klebs-Löffler* in breadth. Gram-positive, with variation in depth of staining. No spores are seen at the end of 48 hours' incubation.

2. *Gelatin stab*.—Usually no growth at bench temperature 20° to 22°C. if the gelatin is uncovered with vaseline. In the jar at 37°C. growth occurs, but the gelatin is not usually liquefied until the 21st day. We find these atoxic strains liquefy gelatin less rapidly than toxic ones.

3. *Glucose agar stab* (or agar stab without glucose) (Fig. 1). At 72 hours at 37°C. shows no growth aerobically, but when such stabbed tubes are subsequently transferred to the jar, typical textbook fir tree growth extends to the sides of the tube by the 4th day; slight gas formation may occur; some strains do not produce growth along the central stab, but rather concentrate on the lateral growth without having an obvious central core.

4. *Fildes' agar slope*.—On the 4th day rods appear from 2 $\mu$  upwards, length indeterminate, many showing terminal spherical spores; the typical film with filamentous edge is apparent, but we have found this film at its best when in process of isolation *B. tetani* is in association with other anaerobes.

5. *Fildes' agar plates*.—(a) Surface colony irregularly filamentous (Fig. 2) spreading, translucent and very difficult to photograph. (b) Deep colony may or may not have a darker brown centre distinctly filamentous with fuzzy periphery (photomicrograph, Fig. 3).

6. *Potato*.—No growth after 5 days' incubation.

7. *Löffler's serum*.—After 5 days there is definite though feeble digestion.

8. *Coagulated egg medium (Locke)*.—Glistening growth is evident after 48 hours, when early surface pitting becomes visible; continued incubation up to the 7th day results in almost complete liquefaction with collection of the fluid at the bottom of the tube, the back of the tube showing slight blackening; films from the fluid show typical drumstick bacilli; this growth on egg is vigorous and characteristic.

9. *Horse blood agar plates*.—Diffuse surface greyish translucent colonies with filamentous edge. No hæmolytic tests have also been done by Neil's method and by Greig's method, using sheep's cells, with no resulting hæmolytic.

10. *Cooked meat medium (Robertson)*.—Some turbidity indicating moderate growth after 48 hours; softening of meat at the top of the tube with a slight pinkish coloration; no odour of putrefaction; odour of the jar containing the culture suggests manure. No sporulation till the 4th day, if then; growth appears to have stopped by the 14th day and usually slight blackening is visible.

11. *Carbohydrate fermentation*.—No carbohydrate is fermented with sufficient activity to cause any change in the indicator; in litmus milk, anaerobic conditions interfere with the interpretation of any biochemical change.

12. *Toxicity*.—1 c.c. of a 4th day broth (Parke Williams) culture injected intramuscularly fails to produce in guinea-pigs either local or generalised tetanus; thirty animals have been inoculated in this way with consecutively isolated strains with uniformly negative results.

13. *Serology*.—In the absence of type sera for which we have made application we cannot say a great deal about these atoxic strains.

For group identification we have however made use of two antitoxic sera in agglutination tests (a) Concentrated tetanus antitoxin [Burroughs Wellcome (1789b)] (8), which is made mainly with the toxin from a good toxin producing strain. It contains 1,000 U. S. A. units per c.c., or 2,000 international units per c.c. (b) Tetanus antitoxin (Hoechst), containing 300 international units per c.c. Several strains

of 48 hours' broth culture have been put up against these sera, with the usual controls, using Dreyer's technique. Most of them agglutinate in dilutions varying from 1:50 to 1:500 with the Burroughs Wellcome serum but not with the Hoechst serum.

Using 48-hour broth cultures injected intramuscularly and intravenously we have succeeded with difficulty in immunising a rabbit, the serum of the animal giving an agglutination of 1:250 only with the homologous organism and other strains.

### Conclusions.

The following are the conclusions in this preliminary communication.

(a) Atoxic *B. tetani* occur in the stools of from 40 per cent. to 50 per cent. of Egyptian fellaheen.

(b) These strains show deviation from the genuine toxin producer in such attributes as hæmolytic, gelatin liquefaction, poor antigenicity, and absence of toxicity as assessed by ordinary methods.

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## ACCELERATED PRODUCTION OF SPECIFIC URINARY PIGMENTS BY DRUG ADMINISTRATION.\*

### I. EFFECT OF PHENYLDIMETHYLPYRAZOLON ON UROBILIN FORMATION.

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#### Introduction.

THE relation of chemical constitution to physiological activity in synthetic therapeutic agents has long been a subject of fascinating interest. Aside from purely theoretical aspects, the action of chemical agents upon the animal organism, and upon mankind in particular, is avowedly of the greatest importance. A knowledge of the relationship obtaining is of fundamental significance and importance—not alone to those contemplating the exploration of this vast field, but is certainly of no less import to the practitioner whose duty it is to prescribe the employment of this particular class of medicinal substances. It is believed, therefore, that the paper here presented—the first of a

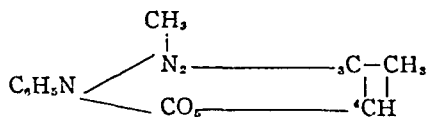
\*This paper was presented before the Medicinal Division of the American Chemical Society at Atlanta, Georgia, April 7th to 11th, 1929.

contemplated series dealing with urinary pigment formation engendered by the administration of specific organic medicinals—will be of interest alike to the members of the medical and pharmaceutical professions, as well as to the chemist and others engaged in scientific work.

In a previous research,(1) the author has furnished data describing the pronounced action of the sulphone, diethylsulphonemethylethylmethane (Trional) upon the production of the pigment, hæmatoporphyrin. This was followed by a paper dealing with the accelerating effect of the most therapeutically active member of this series of alkylated soporifics, diethylsulphonedimethylethane (Tetronal), upon the porphyrin, in which attention was accorded to the fact that an increase in ethyl groups in the molecular structure of this aliphatic compound imparts, in addition to a high degree of therapeutic activity, properties which result in the formation in the system of a proportionately greater amount of hæmatoporphyrin than that observed when either sulphonal or trional is ingested(2). This work prompted the desire to commence further investigations of like character, in the effort to ascertain the ultimate effect of certain compounds upon the production of physiological bodies of known, definite structure.

#### Historical.

It will be recalled that the constitution which Knorr(3) first ascribed to a tetrahydroquinoline derivative was the cause for testing the so-called dimethyloxyquinizine, the antipyretic effect of which was found to be most pronounced.(4) At a later period this compound was recognized as phenyldimethylpyrazolon(5)—better known at present, perhaps, as antipyrine—possessing the structural formula:



While Michaelis(6) affirms that another formula may also be ascribed to this compound, that given is considered as more correctly embodying the chemical constitution of phenyldimethylpyrazolon.

It may be of interest to observe at this juncture that, while antipyrine was once widely prescribed in conjunction with sodium bromide in the treatment of disorders of nervous origin (its anæsthetic action on nerve endings rendering its application rather desirable in these conditions), its employment in this respect has been considerably curtailed by the advent of derivatives, such as 4-dimethylaminoantipyrine (Pyramidon), Pyrosal, and certain others in which alkylation of the nitrogen has taken place.

#### Method.

The method of Hoppe-Seyler(7) was applied in the estimation of urobilin in the samples of normal and pathological urines under examination, ensuring, it is believed, a high degree of accuracy. The essential procedure is as follows:—

One hundred ml. of urine are acidified with 1 : 4 H<sub>2</sub>SO<sub>4</sub>, and then saturated with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. After one hour has elapsed, the precipitate is collected on a filter, washed with a saturated solution of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, and repeatedly extracted with a solution consisting of equal portions of C<sub>2</sub>H<sub>5</sub>OH and CHCl<sub>3</sub> after pressing firmly. The filtered solution is treated with H<sub>2</sub>O in a separatory funnel until the CHCl<sub>3</sub> separates well and becomes clear. The CHCl<sub>3</sub> solution is evaporated on the water-bath in a weighed beaker, the residue dried at 100°C., and then extracted with (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>O. The ethereal extract is filtered, the residue on the filter dissolved in C<sub>2</sub>H<sub>5</sub>OH, and transferred to the beaker and evaporated; then carefully dried and weighed.

#### Experimental.

Recognition was accorded the fact that the urinary pigment here considered is present in increased quantities in disorders accompanied by fever; in malaria, cardiac diseases, atrophic cirrhosis of the liver, and certain other physiological conditions. Adequate precaution was taken to obviate any discrepancies that might accrue as a result of the presence of factors that might tend to introduce errors in the experimental portion of this work.

Ten samples of urine, representing the 24-hour output of patients for whom the antipyretic had been prescribed, and to whom it had been administered in dosages of 15 grains per day intermittently, for a period of ten days, were collected on the eleventh day. Ten additional samples, taken from patients whose hospitalization had not required the use of antipyrine, and who were, apparently, free of any disorder that might cause an increase in the production of urobilin, were collected and subjected to the same treatment given the physiological urines.

Table I furnishes the data obtained by careful analysis of the samples of normal body fluid.

TABLE I.

#### Determination of Urobilin in Normal Urine.

Amount expressed in mg. per litre.

Sample No.	1	2	3	4	5	6	7	8	9	10
Quantity	.. 45	34	38	29	45	33	78	42	37	49
Average	.. 43 mg.									

The ten samples of urine obtained from patients who had been given the antipyrine treatment were next submitted to chemical examination, and the results given in Table II observed.



TABLE II.

*Determination of Urobilin in Pathological Urine.*

Amount expressed in mg. per litre.

Sample No. . .	1	2	3	4	5	6	7	8	9	10
Quantity . .	98	110	108	95	138	106	142*	80	104	126
Average . .	112 mg.									

\* Patient developed a decided icterus.

*Remarks.*

Consideration of the results tabulated justifies the belief that the continued employment of phenyldimethylpyrazolon over a period of ten days or less promotes the disintegration of erythrocytes, causing a condition characterized by the appearance of excessive amounts of urobilin in the urine. While certain forms of disease also tend to emphasize this condition, the action of the synthetic appears to be most readily discerned. As will be shown in a later paper, acetanilide exerts a similar effect, but fails to act as quickly as the compound here considered.

While some degree of variation has been experienced in the different results, it is obvious that the samples of urine obtained from the physiological sources contain a marked excess of urobilin over that generally encountered in so-called normal urines.

*Summary.*

(1) The administration of phenyldimethylpyrazolon (antipyrine) over a certain period of time occasions the appearance of an abnormal quantity of urobilin in the system.

(2) It is believed that the disintegration of erythrocytes is considerably augmented by continued ingestion of this antipyretic, resulting in an increased proportion of the urinary pigment.

(3) Data are furnished, showing the relative amounts of urobilin existing in normal and physiological samples of urine.

(4) Future work on the effect of certain other therapeutic agents upon urobilin production is contemplated.

*Acknowledgments.*

The author desires to acknowledge, with thanks, the co-operation extended to him by Dr. Harry Goldsmith, M.D., physician-in-chief, Psychopathic Department of Baltimore City Hospitals, from whom a number of the samples of urine utilized in the tests were obtained, and the assistance rendered by Nelson T. Carey, M.D., of the staff of Mercy Hospital,\* in furnishing samples of urine which were previously examined and employed for control purposes.

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## A Mirror of Hospital Practice.

## A CASE OF RHINOLITH.

By ATITHI PRASANNA JANA, M.B.,

*Medical Officer, Balagaria Digambor Charitable Dispensary, Midnapore.*

THE patient, a Hindu female, aged 30 years, came to my outdoor dispensary with the following complaints:—

(1) Difficulty in breathing through the right nostril, for about a year, which was gradually increasing.

(2) Offensive breath originated about a year ago and gradually became worse.

*Personal history.*—She is married and her husband living. She has three healthy children, all living. She comes from a very poor family in a mofussil village and lives on average poor class Bengali diet.

*History of past illness.*—Denies history of any serious illness. Denies history of any foreign body going inside the nostril. Denies any history of syphilis or any injury to the nose, gives a history of epistaxis at the age of 13 or 14, but it was cured after a year or so without any treatment, and she was quite all right for about 15 years, after which she got the present complaint.

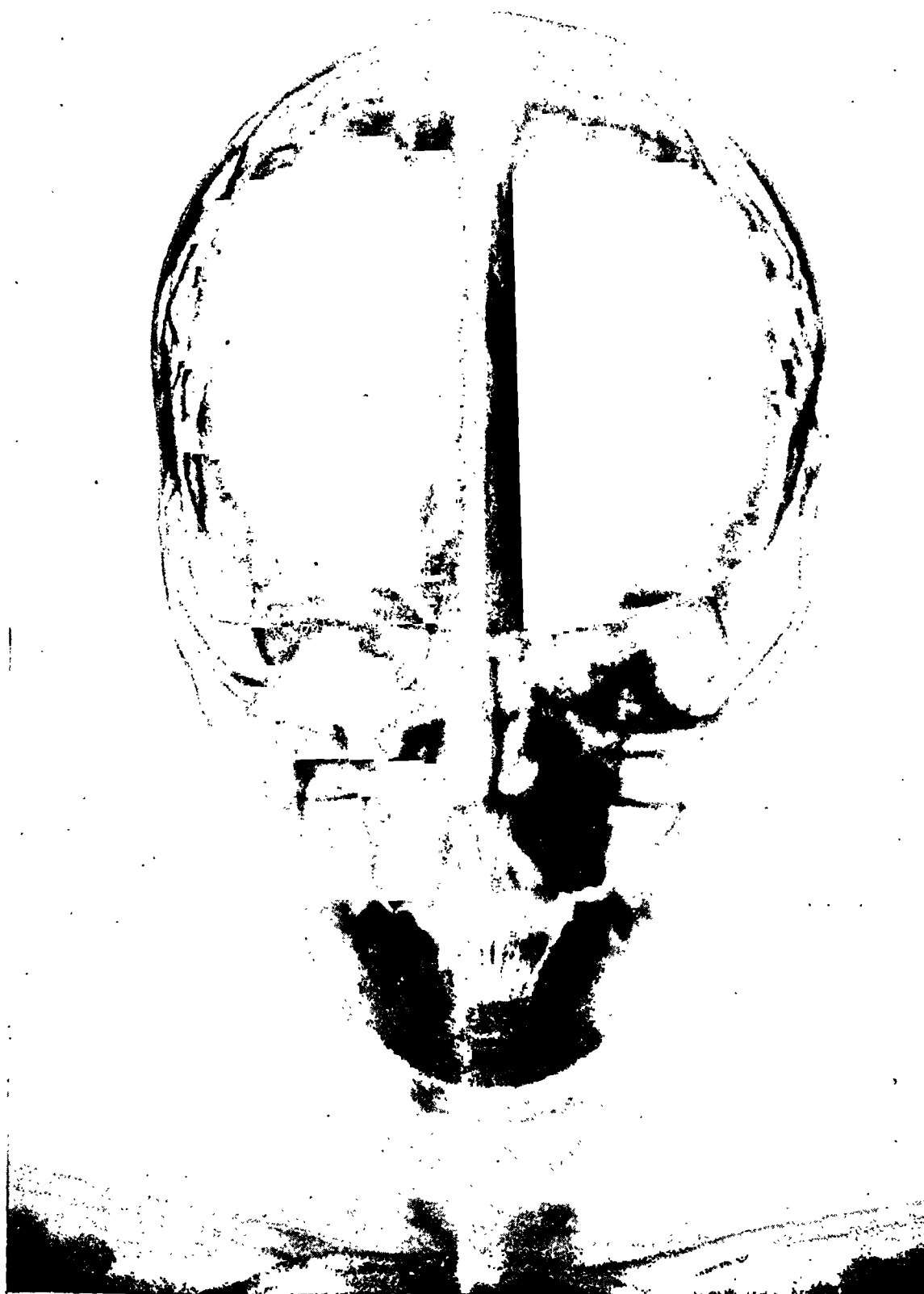
*Examination and treatment.*—In order to clean the nostril, at least partially, of the offensive discharge so as to be able to make a thorough examination the following lotion was given to sniff up daily for a week—sodi bicarb, sodi chloride, borax each gr. xii, aqua oz. iv. On her next visit, after a week, the nostril was examined with a nasal speculum and a black body was visible against the lateral wall and the floor of the nostril and it gave a stony feel to the probe. After thorough examination it was found to be about the size of an adult thumb with two projecting spicules, one anteriorly and the other behind. It had to be broken to pieces for extraction, as it could not be extracted as a whole through the aperture of the nostril. After clearing the nostril of the stone the above lotion was repeated for sniffing. She next came about a week later and her nostril was found to be quite healthy.

The broken pieces of the stone were sent to Major G. Shanks, I.M.S., Professor of Pathology (Medical College, Calcutta), who had the stone examined by the Chemical Examiner who informed him that it was composed of calcium phosphate with traces of iron, magnesium and organic matter.

Now the question is what was the origin of the rhinolith? What formed its nucleus? Rose and Carless say that foreign bodies of the nose may not cause any difficulty in children and so may remain undetected, and this forms the nucleus of a rhinolith in future. But this seems unlikely in an adult of 30 with a history of trouble only for a year. The pieces did not show any sign of foreign body in the central portion. It is possible that a small clot left after the epistaxis may have formed the nucleus.



A case of oxycephaly. Lateral skiagram.



A case of oxycephaly. Antero-posterior *skiagram*.

I wish to thank Major Shanks, I.M.S., for taking an interest in this case and for sending me the report of analysis by the Chemical Examiner.

### A CASE OF OXYCEPHALY.

By G. GALSTAUN, M.A., D.M.R.E. (Cantab.),

M.R.C.S., L.R.C.P.

(Hon. Radiologist, Medical College Hospitals, Calcutta.)

OXYCEPHALY, otherwise known as acrocephaly or tower skull, is a sufficiently rare condition to merit the record of a case. S. M., a girl, aged nine, was referred to me at the Medical College Hospital for a radiographic opinion by my colleague Major Banerjee, I.M.S.

The history was as follows:—The child had a normally shaped skull at birth. As she grew up the skull began to elongate until the present condition of an enormously tall skull had been reached. There had been progressive blindness from the age of three onwards. Headaches had started shortly after, increasing in severity, and often accompanied by vomiting. There was no history of any other illness worth noting. The father and mother of the child appeared healthy, and denied any history of specific disease.

The child's present condition was as follows:—Under-sized. She had the appearance of a child of six. The skull was much elongated and short in an antero-posterior direction. No other bodily deformities such as the acrocephalosyndactyly with union of the digits of hands and feet, described by Apert, were present. The upper maxilla was under developed. The child was totally blind, complete optic atrophy being present on both sides. Some exophthalmos was present. Severe headache and vomiting were complained of. Intellectually the child was normal for its age, its looks belying its intelligence.

The sense of smell was impaired. A Wassermann reaction was refused, as was the decompression suggested for the relief of the severe headaches.

Skiagrams showed the following:—

(1) An enormously elongated skull, narrow antero-posteriorly.

(2) A complete synostosis of sutures.

(3) A wavy, billowy appearance of the vault of the skull, apparently caused by pressure of the convolutions of the brain, thinning out the vault in places.

(4) An underdeveloped upper maxilla with very small antra.

(5) Practically complete absence of the frontal sinuses.

(6) A large and deep sella turcica, very much larger than normal.

Park and Powers have described twenty-nine cases and believe that the condition tends to be familial, and is due to a defect in the germinal plasm.

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### CONGENITAL BILATERAL ABSENCE OF THE RADIUS AND THUMB.

By A. R. D'ABREU, F.Z.S., L.M.S.S.A. (Lond.), I.M.D.,

Civil Surgeon, Mianwali District, Punjab.

CLUB-FOOT from congenital absence of one or other of the long bones of the leg is a comparative rarity, but club-hand from the same cause is still more uncommon and hence I have considered it worth while recording the case illustrated. The patient is a young Sikh of medium stature, in his early twenties, and he has passed the Punjab matriculation examination. He assists in his father's furniture shop, doing the clerical work and other minor duties which his deformity allows. He is able to grasp a pen quite easily and writes with comparative facility.

There is complete absence of the radius on both sides and also of the thumb (all three bones). The ulnas



are bowed and are about two-thirds the normal size and the hands articulate with their lateral aspects on the radial side. The muscles of the forearm are very poorly developed and the wrist and finger joints are flail-like. The fingers can only be partially extended but flexion is easily accomplished. The grip is very weak. There is no history of deformity in the parents or grand-parents and his brothers and sisters are normal in development. There was no apparent illness in the

mother during the pregnancy, nor any injury or accident.

I have not been able to consult books on orthopædic surgery, and I have not seen this deformity illustrated in any of the newer textbooks on surgery to which I have access, but in the 1895 edition of Treves's *System of Surgery*, Vol. 2, Mr. H. H. Clutton, of St. Thomas's Hospital, depicts one case of a baby under his care which died, and he refers to six others described earlier, four by Shattock and two by Parker. The explanation of these deformities is difficult and the following possibilities occur to one's mind. Beyond a reference to the congenital origin of such deformities, few explanations or theories are offered to account for the condition. The position in some animals and insects is of interest. In the Indian pariah dog, where the mother is ill-developed and ill-nourished, I have occasionally seen puppies of large litters born dead with deformities of the limbs, especially in size, or the complete absence of one of the ungues.

Such sickly and ill-nourished females sometimes give birth to the occasional tail-less pups found in litters, though I have seen this result also from a perfectly healthy parent. In goats, I have seen kids born with rudimentary limbs. These kids seem to die shortly after birth. Occasionally in the metamorphosis of a butterfly if the larva or chrysalis is handled too much or bruised or damaged in any way, a diminutive imago or one with a difference in the size of the wings may be noticed (not a deficiency of expansion, which is only due to lack of moisture). Further, to digress a little, in human hermaphrodites there is a tendency to simply scrutinise the generative organs in babies and small children and only as age advances, if these cases live, our interest centres on the development of the male and female physical and mental characteristics. The limbs, whether they resemble the male or female sex, are usually found to be the same on both sides. In insects, on the other hand, this would not, on the rare occasions when found, appear to be the case and a sex asymmetry has been observed in the wings. Hermaphroditism in lepidoptera and a few rare instances observed in coleoptera are of great interest. Edwards in the *Proceedings of the Philadelphia Entomological Society* (Vol. IV, page 380) quotes a specimen of *Papilio asterias* where the right wings were both male and the left wings both female, distinctly marked upon both surfaces with no suffusion of colour. More careful examination of these insects directly the final stage of metamorphosis is completed might reveal further developmental errors or omissions. One can ordinarily find mature insects with missing segments of limbs or antennæ, but these are probably due to injury during their active full-formed life.

In human embryology the limb buds appear at the side of the trunk in the third week. The axial portion of the mesoderm of the limb bud condenses into cartilage and later ossifies into the bones. By the sixth week three indentations form in the limb buds which later become in the upper limb, the arm, forearm and hand; and in the lower limb, the thigh, leg and foot. Ossification of the shaft of the radius and ulna is said to take place in the eighth week, of the carpal bones after birth, and of the metacarpals and phalanges also at the eighth week, that of the metacarpal of the thumb being the last to appear. The radius with the metacarpal and phalanges of the thumb are in one line and on the same side of the forming limb, and if we suppose that the development of these bones is laid down in very early life in a series of germs together at the one time, it could be easily understood how any impairment in the process of development at this very diminutive stage of the embryo, would lead to their complete suppression or absence as in the case illustrated. But this is not borne out in fact, for in the case recorded by Sir Frederick Treves there is complete absence on one side, but on the other, the radius is undeveloped and only slightly bigger than a metacarpal bone, there is a mal-developed or merely vestigial metacarpal and the two phalanges of the thumb are present and of normal size. Besides, as it has usually been found by embryologists that the metacarpal bone of the thumb is the last to ossify, there is more reason to suppose that the ossifying centre of the radius being deposited earlier, should result in the radius being present or better developed more often than the metacarpal of the thumb, but this does not seem to be the case. In the large litters observed in dogs, it would seem likely that the cramped condition of the early embryos may cause the obliteration of certain developmental areas or their non-formation altogether. A similar condition might be brought about during the early stages of the human embryo possibly from the uterus not enlarging in harmony with that of the growth of the ovum, and leading to pressure over areas which are later found missing or improperly developed. A diseased ovum or disease in the mother are usually put down as a general explanation of these developmental errors, but this cannot explain the cases under consideration where only certain areas are omitted in development. As regards trophoblastic action, the prolonged or ovum-wise directed action of the outer layer or plasmodi-trophoblast might be a more probable explanation for these defects, and would account for the inequalities or asymmetry met with in some cases. The erosive action of the trophoblast on the decidua which leads to a little bleeding around the embedded ovum may possibly explain a pressure trauma on portions of the ovum from an excessive outpouring of blood

in one or other direction, with consequent pressure on the delicate embryo and suppression of certain developing areas. To stretch a point further, more unlikely causes might be mentioned, such as a mal-poised or a mal-shaped uterus leading to more pressure on certain areas of the developing ovum with obliteration of certain formations, and a similar trauma might be incurred by persistent hard scybalous masses or a distended bladder, tumour formation or deformity of bony parts of the mother, causing pressure on the uterus during the early period of the developing ovum. When it is considered how easily the human uterus sometimes tends to abort, these same uncalled-for muscular contractions may very easily lead to malformations or suppression of parts of the delicate early developing ovum.

I have taken interest during the past twenty years in the observation of individuals with supernumerary digits and have found that when they occur, it is usually an extra little finger (and usually also an extra little toe) which forms the additional digit, and it is exceedingly rare to find an extra digit on the side of the thumb (or great toe). The commonest deformity of the thumb is a bifid terminal phalanx, so that it would appear that additions as regards these digits are usually to be found towards the little finger or ulnar side and omissions, as in the case under review, on the radial side. How this is accounted for is difficult to say. If one visualises for a moment the folded position of the limbs in an advanced foetus, it will be noticed that the little fingers and toes lie outwards, that is to say directly exposed as it were to the pressure of the muscular uterine wall and therefore more liable to be affected, if affected at all, from this cause. This of course can hardly be possible at an advanced age of the foetus with its surrounding liquor amnii and when the limbs are already well formed, except perhaps to cause a deformity of shape; besides, the little finger or ulna side is usually the credit side for extra digits, as has been already observed. If we assume some pressure or other effect even up to say the sixth week of the embryo, this may be possible owing to the position of the limbs at this stage of development. The position of the limbs is described as follows in the embryology section of Grey's Anatomy:—"The limbs are at first directed backwards nearly parallel to the long axis of the trunk, and each presents two surfaces and two borders. Of the surfaces, one—the future flexor surface of the limb—is directed ventrally; the other, the extensor surface, dorsally; while one border, the pre-axial, looks forwards towards the cephalic end of the embryo, and the other, the post-axial, backwards towards the caudal end. The external condyle of the humerus, the radius and the thumb lie along the pre-axial border in the case of the upper

limb; and the external condyle of the femur, the tibia and the great toe along the corresponding border of the lower limb. The limbs next undergo a rotation or torsion through an angle of 90 degrees around their long axes, the rotation being effected almost entirely at the limb girdles. In the upper limb the rotation is outwards and forwards; in the lower limb, inwards and backwards. In this manner the pre-axial (radial) border of the fore-limb is directed outwards, while the pre-axial (tibial) border of the hind-limb is directed inwards; thus the flexor surface of the fore-limb is turned forwards, and that of the hind-limb backwards." When the above-mentioned rotation of the upper limb takes place and the early forming radius and thumb lie externally, in a position, as it were, most exposed to pressure or other forms of trauma, it is then, I would venture to suggest that possibly their further development is omitted or retarded, though the means by which this actually happens has yet to be elucidated.

There used to be a foetus in St. Thomas's Hospital Museum in which all four extremities were wanting; the theory of amniotic bands producing this condition as in some other congenital constriction cases where defined indentations are present around the limbs of newly-born babies, might be applied to cases of this nature; this theory would hardly reconcile the present case, as no question of a constriction across a limb arises.

## A CASE OF EPISTAXIS IN PURPURA.

By R. C. SRIVASTAVA, B.Sc., M.B., B.S.,

*Roorkee.*

A MAHOMMEDAN GIRL, aged 14 years, was under my treatment for trachoma and corneal ulcer.

During the course of treatment she had epistaxis once which continued for about 3 hours and was brought under control by adrenalin douches and cold applications to the head.

About 10 days later she again developed epistaxis and the adrenalin douche was tried again, but with no result. Calcium and iron salts were administered internally but they did not improve the condition. Ten hours later she developed hæmorrhagic eruptions all over the body, viz., face, head, neck, trunk and extremities. The hæmorrhagic areas were round small spots, not elevated above the surface; they did not fade on pressure and their colour on appearance was bright red, but later changed to purplish. An injection of 2 c.c. hæmoplastin was given subcutaneously and the epistaxis stopped 4 hours later, but she had intense nausea and vomiting for 48 hours after.

All possible causes of the purpura were searched for with negative results. The interest of the case lies in the fact that the first sign of the condition was an unusual intractable epistaxis.



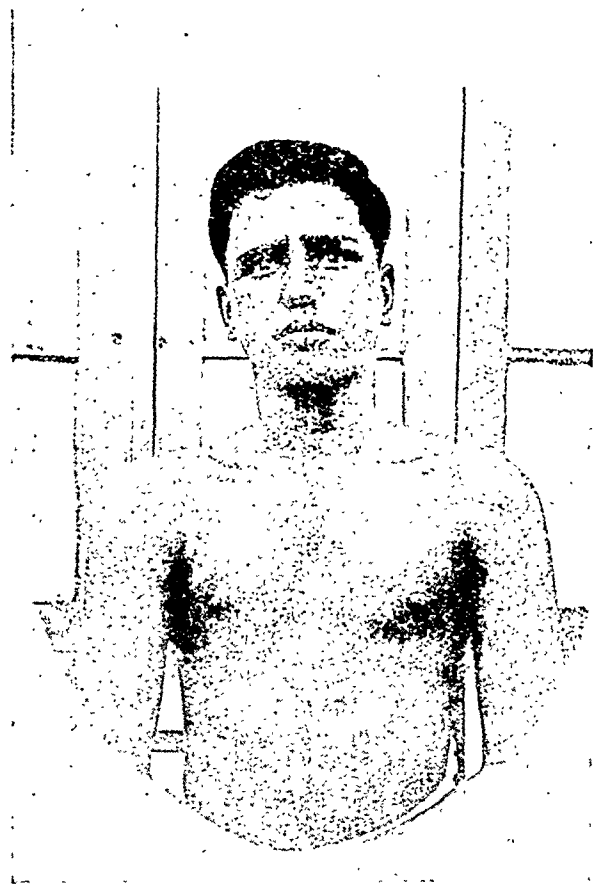
## NOTE ON A CASE OF "DERMAL LEISHMANOID" FROM MADRAS.

By J. H. THEODORE, M.B.E., D.T.M., I.M.D.

*(From the King Institute of Preventive Medicine, Guindy.)*

NAPIER and Das Gupta in their article "A Clinical Study of Post-Kala-azar Dermal Leishmaniasis," *Indian Medical Gazette*, May 1930, referring to cases reported from endemic areas, mention that so far none has been reported from Madras. The following notes and photographs of a case of dermal leishmanoid from Madras will therefore be of interest.

The patient is a Hindu male student, aged 22 years, resident in Madras for over ten years. He first came under my notice in the beginning of April last with a history that about July 1929 he noticed small pimple-like nodules

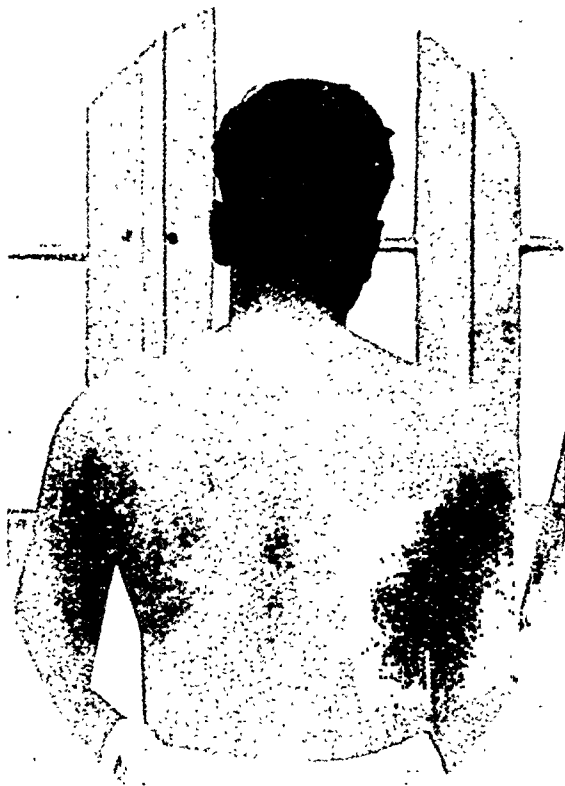


on the cheek and forehead, which gradually spread all over the face and chin. About 3 months after the appearance of the nodules, the patient noticed small white spots on the neck. These became larger and spread all over the body.

The patient did not give a history of previous kala-azar, but said he had an attack of fever in July 1928, which lasted for some days, and was diagnosed as enteric.

In 1925 the patient's brother, who was living with him, suffered from kala-azar, which rapidly yielded to a course of urea stibamine and he has been in perfect health since then.

*Clinical picture.*—The nodules varied in size from a small mustard grain to a large pea. They had a tendency to run together, but did not extend below the face.



The depigmented areas were slightly raised ovoid patches varying in size again from a mustard seed to a pea. They were mostly discrete, and extended from the neck to the waistline, involving both upper extremities up to the wrists.

*Diagnosis.*—Direct smears from a nodule showed *Leishmania* parasites in abundance. Smears from the depigmented areas failed to show *Leishmania* parasites, but showed numerous *Cryptococci*.

The patient was in excellent general health. There was no splenic enlargement or any other clinical sign of visceral kala-azar.

The case presents the etiological factors recorded by other observers; namely that although the patient does not give a previous history of visceral kala-azar the attack of "enteric fever," which was diagnosed on clinical grounds only, might have been an unrecognised attack of kala-azar. In addition the patient gives a history of having been in close association with a case of visceral kala-azar.

# Indian Medical Gazette.

SEPTEMBER.

## SOME ASPECTS OF THE ASCARIS PROBLEM.

*Ascaris lumbricoides* Linn. 1758 is the best known nematode parasitic in man, probably on account of its size and the consequent ease with which it is recognised. Avicenna, an Arabian physician who lived about 1000 A.D., described certain gastro-intestinal disturbances which he considered were caused by this worm and he recommended santonin seeds for their removal. It is a remarkable thing that santonin is still considered by all authorities to be the most efficient drug we have against ascaris.

Our knowledge of the pathological conditions produced by ascaris has extended during the last twenty years, and the list of conditions which have at one time or another been wrongly diagnosed, and which have been subsequently found due to the presence of these worms is a formidable one. These cases can be roughly divided into two classes, viz.:—Class 1. Accidents, mainly due to migration of the worms outside the intestinal canal, practically all of those are surgical in nature. Class 2. Conditions apparently caused by toxins produced by worms in the bowel and absorbed by the host, these conditions are mainly medical.

Among Class 1 are: (a) *Affections of the liver*.—These may be liver abscess, cholecystitis, cholangitis and gall-stones. The records of cases of this nature in which ascaris have been found are fairly numerous, and many of them had a fatal termination.

(b) *Appendicitis*.—In some of these an inflamed appendix, perhaps perforated, has been found to contain one or more ascaris at operation. There are also reports of a considerable number of other cases with all the clinical signs of appendicitis, which have been relieved by exhibition of santonin and passage of worms.

(c) *Peritonitis*.—Ascaris have been found free in the abdominal cavity, having perforated the bowel. In some of these cases the intestinal wall was apparently healthy, but in others it was weakened by ulcers through which the worms had made their way.

(d) *Acute pancreatitis*.—In the cases recorded, the pancreatic duct had been found blocked by an ascaris.

(e) *Intestinal obstruction*.—Acute obstruction of the intestine caused by a knot of ascaris worms is fairly common in countries where they are found infecting a large number of the inhabitants, some of whom harbour many worms. Some of these cases have been correctly diagnosed and santonin treatment has cured them

without operation. Others have not been cured by this method and so recourse to operation and removal of the worms has been necessary. Although most of the cases of this type appear to have occurred in young, strong adults, a number of them have failed to rally after an apparently successful operation, and have died. The deaths in these instances have been ascribed to absorption of toxin from the worms.

(f) Abscesses containing ascaris have been found in such sites as the abdominal wall, scrotum, groin, and even as high up as the eighth intercostal space.

In class 2, which are ascribed to ascaris toxin, the following conditions have been diagnosed on one or more occasions, but subsequent observation and appropriate treatment have shown they were really caused by ascaris, as they cleared up as soon as these worms had been evacuated. The principal conditions simulated by ascaris toxæmia are enteric fever, fever and gastro-intestinal disturbance, gastric ulcer, appendicitis, cholera, pneumonia, tuberculosis, influenza, tetanus, coma, convulsions, meningitis, chorea, neurasthenia, dermatitis, urticaria, and eczema. This is a long list embodying many serious conditions, and it must be remembered that the published records only give the cases properly diagnosed and treated, so that there must be many similar ones in which the true cause is not diagnosed and which consequently remain uncured or die. Another point is that the number of cases of any disease that are placed on record in the literature is a very small proportion of the number of such cases that actually occur in practice. When these two factors are considered it seems certain that ascaris must cause more deaths and serious illness than is generally recognised.

Another potential cause of serious illness arising from ascaris is that brought about by migration of the larvæ through the body of the host. The principal point of injury is the lungs, for the larvæ break their way out of the capillaries to enter the alveoli, and each rupture means a small hæmorrhage. When large numbers of larvæ emerge into the lungs at one time patches of broncho-pneumonia occur, which in very heavy infections may involve considerable areas of lung so that a condition simulating lobar pneumonia is produced. This condition has been experimentally produced in animals on many occasions and two enthusiastic Japanese workers, the brothers Koino, produced severe and nearly fatal pneumonia in themselves by swallowing a large number of ascaris eggs at one time. It is also the proved cause of thumps in young pigs. Migration via the blood stream to the lungs, up the bronchi and trachea, and down the œsophagus to the intestine again is the route that ascaris larvæ must follow to reach full development. But in experimental animals that have received heavy infections it is found that by no means all the larvæ follow

the correct route, for they have been recovered from the brain, retina, and kidneys, in the last instance causing nephritis with passage of larvæ in the urine, and in dogs in the case of the dog ascaris, it has been found that the foetus *in utero* can be infected from the maternal blood stream, via the placenta. Although definite proof is still lacking, it seems almost certain that in countries where ascaris infection is common much acute lung disease begins by the passage of ascaris larvæ from the capillaries to the air spaces with the consequent injury, and when it is remembered that acute lung disease is often the point of onset of more chronic conditions such as pulmonary tuberculosis, bronchitis and emphysema, etc., the probable importance of ascaris larvæ as an ætiological factor in lung disease is still more pronounced.

It is probable that in many countries where the two worms are of frequent occurrence, ascaris really causes as much if not more morbidity and mortality than hookworm, although the latter has received by far the greater amount of attention. During the last year or two there are indications, however, that ascaris is coming to be recognised as of more importance from the point of view of the general health of a community where it occurs.

Ascaris eggs do not normally hatch in the soil or in water, but in suitable conditions of even slight moisture and shade they remain alive and infective for many months and perhaps even years, so that soil contamination with ascaris eggs remains much longer than in the case of hookworm eggs, for the latter hatch rapidly and the free larvæ have a limited existence. These differences in life history are counterbalanced by the mode of infection, however, for hookworm infection is an active process on the part of the larvæ, as they attach themselves to and penetrate skin with which they come in contact, whereas ascaris infection is a passive process and the eggs must be conveyed to the mouth and swallowed for infection to occur.

Ascaris eggs have been found on more than one occasion on vegetables, especially where night-soil is used as fertiliser, and in countries such as China where raw vegetables are largely eaten this is looked upon as one of the principal methods of acquiring infection. But such a condition of affairs is of small importance where vegetables are cooked, for ascaris eggs are almost immediately killed by water at 70°C. In the case of children who are in the habit of playing on contaminated ground near their houses, and who are prone to put all kinds of things into their mouths that they pick up, the source of infection is easy to explain, but among adults in the same localities this is not so simple. Indians of the labouring class eat practically no uncooked vegetables, and

although they generally live in insanitary surroundings, it is difficult to believe that their hands are so grossly contaminated that any appreciable infection is acquired in this way even when taking their food, and as far as our investigations have gone up to the present, there is no evidence that water plays an important part in conveying infection. But examination of a number of persons in any part of India where conditions of moisture, etc., are favourable, shows a high percentage of the population of all ages to be carrying ascaris. This suggests that there is some common way of acquiring ascaris infection that is not yet explained by our existing knowledge of the subject.

We have briefly indicated above the severe and varied symptoms that may arise from ascaris infection, and anyone with experience of practice in a country such as India where this worm is found in more than half the population must be familiar with cases of this nature. There are, however, some rather peculiar things connected with these cases that still await an adequate explanation. The majority of persons harbouring even numerous ascaris appear to suffer only slight if any inconvenience, but occasionally one encounters a case with very severe symptoms which are promptly and completely relieved by appropriate treatment and the evacuation of only one or perhaps two worms. In other words, there is no apparent co-relation between the severity of symptoms and the number of worms present. There are several possibilities that suggest themselves, e.g., do only some worms manufacture toxin in sufficient amount or of sufficient strength to cause symptoms? Is some special condition of the worm's environment, such as the nature of the host's food, responsible for the manufacture of toxin? Are a few people especially susceptible to ascaris toxin and the majority immune against it? Is this apparent immunity natural or acquired? Is there some special condition of the human intestine that allows of absorption of toxin in special cases or at certain times? These are a few of the questions which arise in one's mind and which need investigation to explain the pathology of ascaris toxæmia.

The only satisfactory method of dealing with this, as with all other helminthic infections, is of course prevention, and in the case of an intestinal worm not needing an intermediate host all that is needed is proper disposal of fæces. This appears simple, and so it is if money is available, but in many poor communities the cost of an efficient conservancy service far exceeds the probable cost of the morbidity produced by the helminths in question, and in some places where night-soil is one of the chief sources of fertiliser for agriculture, its destruction would mean a direct loss of revenue added to the cost of its removal.

Under these circumstances it is clear that conservancy is not at present possible in all countries under existing economic conditions, and so it behoves those of us whose work lies among communities to whom night-soil is a source of income, to try and improve our knowledge of the life-history of the parasite and the mode by which it gains entrance into the human host, so that we might reduce the incidence of ascaris infection without materially interfering with the existing customs of the people.

Treatment of course must always go hand in hand with prevention in any complete scheme of disease control, and in the case of ascaris we have fairly efficient remedies in santonin and oil of chenopodium. The former of these drugs is the best, but it is much too expensive to employ on a large scale, and it is not so certain in its action as many of the records would lead one to suppose, for in our hospital practice we always control treatment by the direct centrifugal flotation method of diagnosis, which shows that not many cases are cured by a single dose of this drug, and that a considerable number of cases need three or even more doses before complete cure is established. Oil of chenopodium is less effective than santonin, but it has the double advantage that it is much cheaper and is also effective against hookworms. In most countries where intestinal helminthic infections are a serious problem hookworm and ascaris co-exist, so that oil of chenopodium is very largely used as the best double anthelmintic, and it is now common and sound practice to combine oil of chenopodium with carbon tetrachloride, for although the latter is of little use against ascaris, it is the most powerful agent at our disposal for the removal of hookworms.

A cheaper and more certainly effective anthelmintic than santonin for removing ascaris would be a great benefit, but the prospects of such a drug being discovered in the near future are not bright, for, as we have mentioned at the beginning of this article, santonin was used a thousand years ago, and the only improvement that has been made since then is in the preparation of the drug and the form in which it is administered.

P. A. M.

## SPECIAL ARTICLE.

### TETANY IN CHILDREN.

By GEORGE COELHO, M.B., M.R.C.P. (Lond.),

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TETANY is a condition characterised by excessive irritability of the neuro-muscular mechanism. It may manifest itself by such evident signs as carpo-pedal spasm or convulsions, or be latent with a certain amount of

hyper-excitability of the facial nerve. While some limit the term "spasmophilia" to this latent form, others use it in a broader sense. Though met with in adults tetany is more common in infancy and early childhood.

#### SIGNS AND SYMPTOMS.

1. *Carpo-pedal spasm*.—This sign can be easily recognised, is always present in fully developed cases, and is diagnostic. When the spasm is at its height, the fingers are extended and adducted together with slight flexion at the meta-carpo-phalangeal junction, the thumb is adducted and flexed on the palm and the tip of the thumb may be seen between the middle



D. S. Tetany. Spasm of hand.

and ring fingers. There is well marked flexion at the wrist joint. The position of the hand reminds one of the accoucheur's hand. There is a flexion at the elbow joint and both the hands will be turned towards the median line. When the spasm is severe no movement is possible at the wrist. Any attempt at separation of the fingers is resented because of pain; though the child may grasp its food or leave it without much inconvenience. If the fingers are forcibly separated they immediately come together. In the feet the first row of phalanges are flexed and the second and third extended. All the toes are adducted. The foot is arched and the dorsum is very prominent. The sole is arched from the toes to the heel and sometimes from side to side, presenting a groove. The spasm is usually limited to the feet and hands, though it may spread to other parts of the body. The thigh muscles may be affected and there may be an adductor spasm. Movements at the joints are as a rule not hampered. The spasm is associated with a certain amount of pain which may be sometimes severe. The spasm usually comes on suddenly. It may last from a few hours to some days; it may be relieved and then return again. It is typical of tetany, but as its presence signifies a certain degree of neuro-muscular excitability, it may not be present in every case. But if not apparent it may be demonstrated by tying a ligature round the arm or the thigh when a spasm appears within about two minutes after the

ligature is applied. This sign is named after Trousseau who first noticed it while bleeding a patient in the interval of an acute attack and described it in 1853(1).

2. *Chvostek's sign*.—Tapping the facial nerve at the centre of a line joining the lobule of the ear with the labial fold sets up sudden sharp contractions of the muscles supplied by this nerve. The angle of the mouth and the alæ nasi are drawn upwards and there is a partial contraction of the palpebral commissure. Chvostek, the Hungarian physician who first described this sign in 1876, describes three degrees of this sign(2): feeble, when only the peribuccal muscles are affected, medium when all the muscles of the same side of the face contract, and strong when even the muscles of the opposite side of the face also contract. When the reaction is strong it indicates that the irritability has reached a high degree. This sign is seldom, if not never, seen before the age of four months, and up to the age of three years it is of great value clinically(3). The drawback of the sign is that it is sometimes difficult to elicit it in a child because of its nervousness.

3. *Erb's sign*.—Erb, the German neurologist, found that in tetany there is an increase in the sensibility of the motor nerve to the galvanic current. Normally the threshold is high in early infancy and is lowered as the infant grows in age. For the purposes of diagnosis a cathodal closing contraction is of no value, while a cathodal opening contraction with a current of less than five milliamperes in a child below five years of age is positive evidence of tetany. An anodal closure contraction with a current of less than five milliamperes in a child less than six months old is suggestive of tetany. An anodal opening contraction with a similar current in the first six months is strong evidence of tetany, while only suggestive of the condition if obtained between six months and two years, and especially so if the anodal opening contraction is obtained with a current weaker than the anodal closing contraction. Therefore any contraction other than a cathodal closure contraction obtained with a current weaker than five milliamperes in a child less than six months old has a significant value: from six months to five years only a cathodal opening contraction obtained with this current has any value(4). Besides the fact that the reactions may vary, there is great difficulty in eliciting these reactions in children with any great accuracy.

Of the three signs, Trousseau's is the first to disappear, lasting about three or four days after treatment is started. Chvostek's sign lasts longer and may persist for weeks; Erb's lasts the longest. In spite of its great delicacy, the difficulty of applying it practically robs it of most of its value. Trousseau's sign is the last to appear and the first to disappear.

4. *Laryngeal spasm*.—Escherich was one of the first to lay emphasis on this sign. It consists of a contraction of the muscles of the larynx which may narrow or close the rima glottidis. When the obstruction is severe the child throws back its head, the face becomes livid and the respiration stops for a few moments. The cyanosis increases and the child makes frantic efforts to breathe; with the relief of the spasm the child takes a long deep inspiration with a crowing sound and in a few moments again the respirations become normal. Should the spasm last long the asphyxia may be of such intensity as to cause convulsions or even death. Fortunately most of these attacks cease before death supervenes. When the laryngeal obstruction is mild, there is a crowing sound with each inspiration which disturbs the parents who become quite anxious about the child. The severe spasms generally come on when the child is crying or is in a rage. The number of spasms per day varies and may be even as many as twenty, especially of the milder type. This sign is seldom seen after about 18 months of age. The place of this sign in the symptomatology of tetany has been established by the fact that the patients show other manifestations of tetany, like facial irritability and increased irritability to galvanic currents.

5. *Convulsions*.—These may be generalised or be local. If general they are associated with loss of consciousness. General convulsions may supervene in cases of laryngospasm, or occur independent of them. Localised convulsions are seen in the form of twitchings of different muscles of the body. Some clinicians are of opinion that all convulsions in infancy that cannot be traced to a nervous lesion are due to tetany. Perhaps it would be more correct to say that tetany is an important cause of convulsions in infancy and when they do occur, especially in a case with rickets, tetany as a cause should be first excluded. The number of attacks of convulsions in tetany is generally very high in a day.

6. *Retention of urine* because of a spasm of the sphincter of the bladder, persistent vomiting because of the spasm of the pylorus, spasm of the intestine with constipation, and spasm of the anal sphincter are rare signs found in tetany(5).

#### *Ætiology.*

Tetany is rare before four months and after three years. The commonest age is between six and twenty-four months. A large number of children suffering from tetany show evidence of rickets. Lesne and Turpin found signs of rickets in two-thirds of their cases of latent tetany(6). Rickets predisposes children towards tetany, for in the former condition there is a defective absorption of calcium and phosphorus(7) and the serum calcium may fall so

low as to cause tetany. In spite of the frequency of rickets, tetany on the whole is not common in the city of Bombay. Tetany may also supervene in infants that suffer from persistent vomiting, be it due to pyloric stenosis, spasm or other causes. It is also sometimes met with in cases of severe diarrhoea. Syphilitic infants are predisposed towards this condition(8). Rarely it comes on in cases of infectious fevers and in pneumonias.

There is a fall in the serum calcium, but the phosphorus is not affected. The serum calcium may fall as low as 6 milligrammes in fully developed cases or may be as high as 9 milligrammes in latent tetany. But the fall in serum calcium is not always the rule. Scott and Usher report two cases of tetany where the serum calcium was estimated at 9.6 and 9.3 milligrammes respectively(9). In one of my cases it was 9.5 milligrammes. There is a fall in the calcium in the cerebro-spinal fluid, which is normally above 6 milligrammes per 100 c.c. Ingvær reports that in his cases it averaged 4.28 milligrammes(10). According to Loeb the excitability of a nerve depends on the ratio between the sum of sodium and potassium ions together and calcium and magnesium ions in the blood. The amount of sodium, potassium and magnesium ions in the blood is normal in cases of tetany, and the increased irritability of the neuro-muscular mechanism can only be due to the decrease in the calcium ions. Calcium exists in the blood in the dissociable and non-dissociable forms, and it is only the former or rather the ionised part of the former that is important in this rôle. That is why an estimation of serum calcium may not be a true guide to the extent of deficiency of calcium ions, because the defect in calcium metabolism may just be a defect in its utilisation in the body. Estimations of calcium ions are difficult. But the calcium in the cerebro-spinal fluid is considered equivalent to the dissociable calcium in the blood(11). This calcium content is always below normal in all cases of tetany. The fall in the calcium has been ascribed to various causes. Wilson ascribes it to an alkalosis and explains the tetany seen in cases of persistent vomiting and dyspnoea on this basis. The parathyroid glands also play a part in the metabolism of calcium. There is an inter-relation between the parathyroid hormone and vitamin D.

Morgan and Garrison have shown that parathyroid extract does not cause hypercalcaemia in dogs that are fed on a diet that is deficient in vitamin D(12). Experimentally tetany has been produced in animals by parathyroidectomy, and in human adults the close association of tetany with this gland has been proved. Yet the relation with infantile tetany has not yet been definitely proved, though recently very encouraging reports of the treatment of tetany by parathyroid extract have been published(13).

Findlay and Noel Paton ascribed tetany to the toxic action of methyl-guanidine which accumulates in the blood when the activity of the parathyroid glands is impaired.

#### *Diagnosis.*

Carpo-pedal spasm is typical and is diagnostic. With a certain amount of care and patience Chvostek's sign may be clearly elicited. Frequent attacks of crowing inspiration are very suggestive of tetany, especially so if there be occasional severe attacks. Convulsions in infants which cannot be traced to a nervous lesion are often caused by tetany, and in such cases there will be evidence of spasmophilia. In doubtful cases estimation of the calcium in the cerebro-spinal fluid would be more useful.

#### *Prognosis.*

This depends on the age of the patient and on the type and severity of the manifestations. Severe laryngospasm may be fatal. Frequent convulsions are a source of great danger. Otherwise the younger the child and more severe the signs the more serious the prognosis. Cases of latent tetany with proper treatment respond very well and are soon safe. On the whole the prognosis is better if the child is over two years in age. Gastro-intestinal disorders and infectious diseases always mar the prognosis.

#### *Treatment.*

The agents used in the treatment of tetany may be classed into two groups:—those that raise the serum calcium quickly but temporarily, and those that do so slowly but more permanently. To the first group belong calcium salts and parathyroid extracts, and to the second irradiated ergosterol, irradiated cholesterol, ultra-violet rays and cod-liver oil.

To produce immediate effects in severe cases calcium will have to be given intravenously and five to ten cubic centimetres of a five per cent. solution may be injected. But because of the restlessness of the infants it is often too difficult to follow this procedure. The oral method is easier and gives satisfactory results. To a child of one year about fifteen grains of the chloride or lactate may be given in milk four or six times a day, depending on the severity of the illness. Of the two, children take the lactate better. With these large doses the twitchings, carpo-pedal spasm, and laryngospasm disappear in about three days' time, and Trousseau's sign in about as many days again. But Chvostek's sign still persists and may do so for a long time. The twitchings and convulsions all or singly may reappear immediately the calcium is stopped, and therefore it is necessary to utilise other agents to maintain the serum calcium at the normal level.

Hoag and Rivkin(14) have used parathyroid extract (Collip) in the treatment of tetany in infants. The dose they used has been five



units of the extract per kilogramme weight of the body for each milligramme rise in serum calcium that is desired. This total dose is administered in smaller doses by means of subcutaneous injections at intervals of four to six hours, the total quantity being injected within 24 to 36 hours. In all their cases there was a rapid improvement in the signs and symptoms of the disease and the serum calcium reached the normal in 24 to 48 hours.

Among the agents of the second group, irradiated ergosterol raises the serum calcium to the normal sooner than the others. It is usually administered by the mouth, but in cases of severity has also been injected intravenously. Gleich and Goodman did so in a severe case in a dose varying from 2 to 10 milligrammes with very satisfactory results(15). There are many preparations containing irradiated ergosterol; the one we use is Vigantol prepared by Bayer of Germany. Rohmer, Woringer and others treated cases of spasmodophilia with this preparation. These presented convulsions, carpo-pedal spasm, laryngospasm. With the simple administration of Vigantol alone they found that the convulsions disappeared on the second day in one case, on the third day in two cases, and on the fourth, sixth and thirteenth day in one case each. In nine cases there were no convulsions. The nervous hyper-excitability always disappeared in a week or two of treatment. The serum calcium, which varied from 5.5 to 9.3 milligrammes per cent., was soon definitely raised and was generally normal within two weeks(16). Bakwin and others studied the effect of irradiated ergosterol on 15 infants with hypocalcæmia of varying degree. In all but three of their cases there was evidence of mechanical and electrical hyper-excitability and in 8 of them the serum calcium was 7.5 milligrammes or less. Four milligrammes of 1 per cent. suspension of irradiated ergosterol in sesame oil was given daily. There was a prompt disappearance of the acute symptoms of tetany. In only one case were convulsions noted after the first day of treatment. In 12 out of the 15 infants the serum calcium reached normal from 3 to 12 days. The electrical excitability was normal when the serum calcium reached 8.5 milligrammes(17).

The efficacy of ultra-violet rays in the treatment of tetany was first demonstrated by Huldshinsky. The infant is placed at a distance of about twenty inches from the lamp for a period varying from 2 minutes at the start to 15 minutes as the maximum. These exposures are generally given on every alternate day and a series consists of about fifteen exposures. They may be repeated again after an interval of ten days. Lesné and Turpin report complete recovery after two such series(18), Porez also reports similar success(19). According to Hoag about 14 days are needed to raise the serum calcium to the normal level(20). A

rapid deposition of calcium in the bones may cause a fall in the serum calcium and exaggerate the symptoms of tetany after an exposure to ultra-violet rays. Huldshinsky therefore does not advise them in manifest tetany until other measures have been started(21).

Irradiated cholesterol is not as efficacious as the last two.

Cod-liver oil, though very efficacious in rickets, does not seem to be of the same value in tetany. There is sometimes a fall in the serum calcium, while in other cases there is great delay in raising the serum calcium, though it may be curative if administered in large doses and for a long time(22). If it be combined with irradiated ergosterol, these large doses seem to reinforce the action of the latter.

Besides the above specific treatment, symptomatic treatment may be necessary to control convulsions and to relieve pain. As most of these infants show evidence of rickets they will have to be treated for this condition in the intervals. Plenty of sunlight and fresh air is useful for these children.

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## Medical News.

### THE INDIAN SCIENCE CONGRESS, 1931.

THE Eighteenth Annual Meeting of the Indian Science Congress will be held at Nagpur from the 2nd to the 8th January, 1931. Dr. U. N. Brahmachari, M.A., M.D., Ph.D., F.A.S.B., has been appointed President of the Section of Medical and Veterinary Research.

In view of the fact that a very large number of papers have been received in past years, making it impossible to read all of them in the time available, and necessitating the curtailment of discussion on others, the Sectional Committees have been advised to make a careful selection of papers accepted. Authors are requested to take note of the following points:—

(i) Papers on medical and veterinary research *must* be received by the Sectional President, Dr. U. N. Brahmachari, Asiatic Society of Bengal, 1, Park Street, Calcutta, not later than the 15th October, 1930, which is the last date for accepting papers according to the rules.

(ii) Only original papers, that is to say, papers which have not already been read or published in the same or similar form, will be accepted.

(iii) Not more than two papers will be accepted from any one contributor.

(iv) Papers must not take more than 20 minutes to be read. It takes 3 minutes to read a page of foolscap intelligibly, apart from diagrams, slides, etc. Papers should not, therefore, exceed 7 pages of typed foolscap.

(v) Papers *must* be accompanied by 3 typed copies of an abstract of the paper. This abstract must not exceed 200 words, and should not contain any formulæ or diagrams. *Papers not accompanied by such abstracts will not be accepted.* It is not fair to members of the Congress not to have due notice from the programme of what a paper is about.

(vi) All diagrams, tables, pictures, etc., should be reduced to lantern slides, or enlarged to posters corresponding in type to 6/18 Snellen.

(vii) Authors should not contribute accounts of their papers to the local lay press. It is hoped that it will be possible to arrange for a daily précis of the proceedings in the Medical and Veterinary Section to be sent to the press officially by the President of the Section.

(viii) Workers in Bengal and neighbouring provinces are requested to send their papers *before the 21st September, 1930*, when the Durga Puja holidays will begin this year. The attention of workers is drawn to the resolution of the Executive Committee that abstracts of papers submitted after the last date, i.e., 15th October, 1930, *shall on no account be printed in the advance copy of abstracts.*

(ix) Papers will not be accepted from individuals who have not paid their subscription for membership. Forms of application for membership can be obtained from the General Secretary, Asiatic Society of Bengal, 1, Park Street, Calcutta.

Will our readers kindly take this notification as their first official intimation with regard to the 1931 Congress? We trust, further, that the members of the medical and veterinary professions in Nagpur will co-operate to make the 1931 Congress a successful one.

There are three classes of members of the Indian Science Congress, viz.:—

(i) Full members; annual subscription, Rs. 10.

(ii) Associate members; annual subscription, Rs. 5.

(iii) Student members (who must be certified by the principal of their college to be such), Rs. 2.

Only full members have the right to read papers. Associate and student members may submit papers through a full member. Subscriptions should be paid

to the Hony. Treasurer, Indian Science Congress, c/o the Asiatic Society of Bengal, 1, Park Street, Calcutta.

### FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE, 8TH CONGRESS.

We have been asked to announce the following:—

The 8th Congress of the Far Eastern Association of Tropical Medicine will be held at Bangkok, Siam, commencing on 7th December, 1930, and lasting till 21st December. The first week will be devoted to the Scientific Conference while the second week will be taken up by tours in Siam. All licensed medical, dental and veterinary practitioners are eligible for membership. The membership fees for the period 1927—1930 are £3 and should be paid to the Local Provincial Secretaries of the Far Eastern Association of Tropical Medicine, to whom the names of members in their areas should be submitted. The titles of any papers which it is proposed to place before the Conference should be submitted to the Local Secretaries at an early date. Arrangements will be made for the reading at the Congress of any paper submitted by a member who is unable to attend.

Further information may be obtained from the Local Provincial Secretaries, or from the Acting Secretary for India, c/o Central Research Institute, Kasauli, Punjab, British India, or the Far Eastern Association of Tropical Medicine, c/o Hoofdkantoor van den Dienst der Volksgezondheid, 10, Parapattan, Weltevreden, Java.

The Local Provincial Secretaries are:—

Assam—Lieutenant-Colonel T. D. Murison, I.M.S., Director of Public Health, Assam, Shillong.

Bengal—Lieutenant-Colonel A. D. Stewart, I.M.S., Professor of Hygiene, School of Tropical Medicine, Calcutta.

Bombay—Major C. L. Bilderbeck, Port Health Officer, Bombay.

Burma—Dr. J. A. Anklesaria, Director, Harcourt Butler Institute of Public Health, Rangoon.

Madras—Lieutenant-Colonel A. J. H. Russell, C.B.E., I.M.S., Director of Public Health, Madras. Acting Local Secretary—Captain N. R. Ubhaya, Acting Director of Public Health, Madras.

Punjab—Lieutenant-Colonel C. A. Gill, I.M.S., Director of Public Health, Punjab, Lahore.

U. P.—Lieutenant-Colonel C. L. Dunn, I.M.S., Director of Public Health, U. P., Lucknow.

Acting Local Secretary—Lieutenant-Colonel W. A. Mearns, Officiating Director of Public Health, U. P., Lucknow.

C. P.—Lieutenant-Colonel William Tarr, I.M.S., Inspector-General, Civil Hospitals, Central Provinces, Nagpur.

## Current Topics.

### Discussion on Tropical Diseases Arising from Dietetic Deficiency.

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MAJOR-GENERAL J. W. D. MEGAW: At the outset it is desirable to take a broad general view of the part played by dietetic deficiency in causing disease in the tropics. The three chief types of deficiency are: (1) Shortage of food as a whole. (2) Shortage of proteins. (3) Shortage of vitamins. As it was probably intended that this discussion should deal specially with the question of vitamin deficiency, I shall only make a passing reference to the other forms of dietetic defect, although I regard them as being of far greater importance.

Millions of people in the tropics live close to the border line of starvation even in normal years, so that when a harvest fails, there is actual destitution in those countries which have no provision for famine relief. The real problem for most people in the tropics is the adjustment of the population to the food supply. Sanitarians and research workers should recognize that their efforts to improve the conditions of human existence will be of little avail so long as every advance in disease-prevention is nullified by a corresponding increase in the population.

The well-being of a community rests on four supports—production, controlled reproduction, disease prevention, and the maintenance of personal security. If any one of these is allowed to become weak, the condition of the people is bound to be precarious. My reason for emphasizing these obvious points is that there has been a tendency for medical workers to rely on their own unaided efforts and to fail in their duty of educating Governments and peoples in the need for coördination of forces in dealing with the problems of human existence.

Next in importance to the provision of an adequate supply of food as a whole comes the necessity for a sufficiency of suitable proteins.

The work of McCay on the nitrogen factor in nutrition has demonstrated quite clearly that most people in the tropics suffer from a shortage of available proteins. McCay could find little evidence of vitamin deficiency in the diets which he investigated, and while I am far from desiring to minimize the importance of vitamin deficiency as a cause of disease, I believe that if we could assure an adequate supply of suitable proteins, the vitamins would take care of themselves to such an extent that they would no longer form a grave problem. It is possible to devise an experimental diet in which there are enough proteins and calories, and yet the vitamins will be quite inadequate for the needs of the body, but if we consider only the everyday diets of the people in the tropics, it is uncommon to find any that are well supplied with proteins and are deficient in vitamins alone.

Turning next to the question of vitamin deficiency. I will confine my remarks to the subject of vitamin B, as this is more than enough for one evening's discussion.

My chief object is to suggest that further investigation is likely to show, on the one hand, that this vitamin plays unsuspected parts in the causation of disease, and, on the other, that a deficiency is not responsible for the ill-effects that have been attributed to it.

We have many examples of the sway which is exercised by "fashions" in medical matters, and most people will admit that vitamins have become a fashion even in research circles. The vitamin-deficiency view of the causation of beri-beri has been exalted to the rank of a medical dogma, and anyone who dissents from it is likely to come under the suspicion of the great sin of heterodoxy. The writers of textbooks are almost unanimous in their adhesion to the view that vitamin B deficiency is the cause of beri-beri, whereas most of the workers who have seen outbreaks of the disease refuse to regard deficiency as a complete explanation of the cases which they have met with, many even denying that it has played an important part in the causation of the outbreaks of which they have had personal experience. It is hard to account for this remarkable state of affairs on any grounds other than the attractiveness of clearly expressed dogmas.

We are all familiar with the reasons for the vitamin-deficiency view of beri-beri; the disease in the Far East has long been recognized as being closely associated with a diet of overmilled rice, and one of its most striking manifestations is polyneuritis. When it was found that avian polyneuritis could be caused by a diet of overmilled rice and could be prevented or cured by adding vitamin B to this diet it was natural to suspect that human beri-beri and avian polyneuritis were the same, and that both were caused by deficiency of vitamin B in the diet. Human experience seemed to supply final proof, for it was noticed that when groups

of labourers suffered from beri-beri while living on a diet of overmilled rice, the disease could be controlled by supplying parboiled rice which is known to be rich in vitamin B. The weak point in connection with this human observation has been ignored. It is that if the cause of the disease was some positive factor like a poison in the kind of rice used, a change of rice supply would abolish the disease just as certainly as it would if the disease were due to deficiency of some essential food factor.

Let us turn for a moment to the attempts which have been made to reproduce the disease in human beings under experimental conditions. Strong and Crowell carried out an important series of experiments on condemned criminals in the Bilibid Jail in the Philippines. The prisoners were kept under strict control on special diets for more than seventy days; all were kept on the same basic diet, which was poor in vitamin B; in addition to the basic diet, some of the prisoners received overmilled rice, another group received overmilled rice and extract of rice polishings, while red rice was given the third group. It was expected that the prisoners of the first group would suffer from beri-beri while those of the other two groups would escape, but the actual results were that ten out of seventeen prisoners in the first group suffered from symptoms suggestive of beri-beri, while two out of six in each of the other two groups also suffered from similar symptoms, though rather less severely.

If we regard the disease as having been true beri-beri, the results are far from convincing from the point of view of the deficiency hypothesis, for seven out of seventeen persons whose diets were specially designed to cause the disease escaped, while four out of twelve suffered from the disease, although their diets contained adequate supplies of the vitamin. What the experiments really showed was that a monotonous diet, deficient in calories, available proteins and vitamin B, caused nutritional disturbances suggestive of beri-beri, and that a supply of vitamin B gave inadequate protection against these disturbances; they also showed the difficulty of devising a diet defective in vitamin B, yet satisfactory in other respects. Strong and Crowell later said that vitamin B ought not to dominate the picture when it is a question of treating beri-beri. Other workers have failed to cause beri-beri in human beings by feeding them on diets lacking in vitamin B, and the only experiment for which success has been claimed in this direction is that of Taguchi who kept five persons on a diet of overmilled rice, with the result that in all the subjects cardiac dilatation developed within five days and anaesthesia of the arms within ten days. The rapidity with which the symptoms appeared is not in keeping with what we know of deficiency diseases, indeed there is a distinct suggestion of intoxication.

Then we have evidence which cannot be ignored, that many outbreaks of beri-beri have occurred among groups of people whose diets were beyond reproach in the matter of vitamin B content, so that both human experiment and human experience are far from demonstrating the existence of a close relationship between beri-beri and deficiency in vitamin B. To suggest that all such outbreaks were of some disease other than beri-beri is to beg the question, for there is no evidence that they were not as much entitled to the name as any others.

My own experience of the subject deals chiefly with a number of outbreaks of epidemic dropsy, a disease which seems to have as much claim to be called beri-beri as the forms of the disease which are seen in the Far East; I have asked both Vedder and McCarrison whether they could suggest any reason for regarding epidemic dropsy as distinct from beri-beri, but neither of them could do so. Some of the reasons for asserting that epidemic dropsy is not a deficiency disease are: (1) The disease usually appears as an explosive outbreak among groups of persons who are living on the usual kind of diet, which differs in no obvious respect from that of their neighbours who remain quite free from

the disease. (2) In several outbreaks it has been found that all the victims obtained their supply of rice from the same shop or store, while their neighbours who bought their rice from other sources remained quite healthy. (3) Most of the victims have been eaters of parboiled rice which is regarded as being rich in vitamin B. (4) In most of the outbreaks there has been no suggestion of any deficiency in vitamin B.

Here again the suggestion has been made that epidemic dropsy is quite different from beri-beri and that arguments based on observations of the disease do not apply to beri-beri, but even if we were to accept this view, we are still faced with the fact that there is a disease of rice-eaters which closely resembles beri-beri and kills or disables its victims just as effectively as that disease does. From the point of view of the working practitioner and of the patients it matters little whether we decide that the one name or the other should be applied to the disease, the results in either case remain the same.

There is much to be said for defining epidemic dropsy as the "beri-beri of eaters of parboiled rice."

A word must be said about the supposed identity of avian polyneuritis and human beri-beri. The manifestations of these diseases are strikingly different in several important respects. In the human disease there is dropsy and cardiac enlargement, while in the avian disease there is a drying up of the tissues and cardiac atrophy. It is true that McCarrison recently found cardiac enlargement in some pigeons which had been fed on a diet to which a small amount of vitamin B was added, and it is to be hoped that further experiments on the same lines will be carried out, as they may throw much light on the subject of avitaminosis and even of beri-beri, but of course, in the long run, what we must aim at is to find out how human beri-beri is caused and how it can be prevented.

#### CONCLUSIONS.

"Beri-beri" is a name which has been applied for many years to certain disease manifestations which occur for the most part among persons who eat rice; the rice which is associated with the causation of the disease has usually been stored in hot and damp place for considerable periods after manufacture. It is quite likely that two or more specific diseases are included in the beri-beri group, but these have not yet been differentiated from each other in a satisfactory manner. One of the diseases is probably caused by poison formed in manufactured rice by the action of microorganisms which have not yet been clearly identified. As in the case with other forms of food poisoning, it is possible that toxic infection may play a part, but the evidence points to intoxication as being the more important factor. It is probable that some of the cases of a disease to which the name beri-beri has been applied are caused by dietetic deficiency and it is likely that vitamin B is the factor which is specially concerned.

As a working hypothesis we may assume that there are two diseases of the beri-beri group—intoxication beri-beri and deficiency beri-beri. The efforts of investigators ought to be directed towards differentiating these and other possible forms of beri-beri from each other and discovering the essential cause of each. Hypotheses which invoke several causes to account for one disease are unsatisfactory and suggest ignorance of the real cause, for although there may be a number of predisposing or auxiliary factors, it is highly probable that each disease has one essential cause. Some workers have even suggested that three distinct causes are at work in producing beri-beri, namely, vitamin deficiency, bacterial infection and endocrine deficiency. In this connection it is legitimate to ask why the endocrine glands have become disordered and to suggest that they may be "more sinned against than sinning."

Finally, medical practitioners need not be depressed by the difficulties surrounding the beri-beri problem, for if they adopt the lines of action indicated by our knowledge of the conditions under which the disease occurs, they will be able to handle effectively the cases and outbreaks which they encounter. In treating the

disease they will cut rice out of the diet and so ensure the elimination of any poisonous substances which may be present; they will also prescribe a diet rich in vitamin B and in all the other health-forming constituents. In preventing the disease they will aim at securing satisfactory conditions for the manufacture and storage of the rice so as to retain the nutritive properties of the grain and prevent the formation of toxic substances; at the same time they will attend to the diets of the people for whom they are responsible and will see that these are well provided with all essentials. Each of these methods of dealing with the disease is inherently reasonable, whatever our views of the causation of beri-beri may be, and it is quite certain that their adoption will lead to its control.

All medical practitioners who have opportunities of observing diseases of the beri-beri group should make careful inquiries into the conditions under which the disease occurs and should keep careful records of its clinical manifestations. Far too often we are told that "so many cases of beri-beri occurred" and receive no information regarding clinical features, so that it is impossible to form an opinion as to the type of the disease. If we insist on regarding beri-beri as a name given to a group of diseases whose members have not been clearly differentiated from each other, it is likely that real progress will be made in our knowledge. What has been said of beri-beri applies to a great extent to pellagra.

Dr. G. M. FINDLAY: Our knowledge of deficiency diseases is derived from two sources: (1) the study of certain diseases occurring in the human subject, and (2) nutritional experiments on animals, conducted in the laboratory.

Before discussing the pathology of those nutritional deficiency diseases which can be produced in the laboratory and which throw considerable light on the aetiology of deficiency diseases in man, it will be well to mention briefly the present state of our knowledge in regard to the constitution of an adequate diet. Broadly speaking, there are two main forms of inanition. The first is the quantitative type, in which all the known necessary food constituents are present in the food, but the amount of the food is insufficient both for the growth and repair of the tissues and for the maintenance of energy. The second form of inanition comprises the various qualitative deficiencies in which there may be complete or incomplete absence of one or more of the great classes of foodstuffs—proteins, fats, carbohydrates, salts, vitamins and water, which together make up a complete diet.

In the case of proteins it is recognized that all the amino-acids are not of equal value in nutrition, for whereas certain acids, such as glycine, can be synthesized in the body, others, such as the aromatic amino-acids, cystine, and probably also the newly isolated sulphur-containing amino-acid, methionine, must be given in the diet, unless pathological changes are to follow. The absence of cystine in the food is associated, for instance, with loss of weight and gradual loss of hair. Gelatine, as is well known, represents a protein which is deficient in a number of amino-acids; but even when gelatine, supplemented by these amino-acids, is fed to rats as the sole source of protein, growth does not always occur, for many of the animals die with symptoms of an acute hæmorrhagic nephritis. (Jackson, Sommer and Rose, 1928).

A deficiency disease which occurs in rats when fats are entirely excluded from the diet, has also recently been described by Burr and Burr (1929). The symptoms are necrosis of the tail and necrotic lesions of the skin. The disease can, however, be cured by the addition of 2 per cent. of fatty acids to the diet. An adequate supply of carbohydrate is also of importance as constituting the most economical method of insuring the necessary amount of energy-producing food in the diet.

A large number of mineral salts are also essential dietary constituents—calcium, sodium, potassium, phosphorus, iodine, iron, and probably, in very small quantities, copper and manganese—for in experiments

on nutritional anæmias in rats it has been found that these two elements are of importance in the formation of hæmoglobin. Possibly a lack of copper and manganese plays a part in the causation of the obscure anæmias of the tropics, of which very little is yet known.

Finally, the ever-increasing number of vitamins requires consideration. Absence of vitamin A in the diet leads, as is well known, to keratomalacia and to changes in the epithelial cells of the respiratory and intestinal mucosa, as well as in the secreting glands associated with these structures. As a result of these changes bacterial infection is favoured, probably owing to the decreased content of the various glandular secretions in lysozyme.

A further vitamin factor, soluble in alcohol and ether, has recently been described by Coward, Key and Morgan (1929). It is present in "light white" casein and milk, and appears to be essential for growth, but little is yet known as to the pathological changes resulting from its absence.

Absence of vitamin C is associated with the development of scurvy in certain species of animals. Vitamin D, which is now known to be irradiated ergosterol, is responsible for the prevention of rickets. The ætiology of rickets is, however, more complicated than a simple deficiency of vitamin D, for it has been recently shown that it is possible to extract from certain cereal foodstuffs, such as oats, a substance which, when injected into animals, lowers the blood-calcium to such a degree that rickets results. Ovarian extract also has the power of lowering the calcium concentration of the blood. This explains why ovariectomy sometimes cures cases of osteomalacia. Certain foodstuffs may therefore contain anti-vitamins. A somewhat similar effect may occur with vitamin E, which controls fertility. Though fertilization and implantation of the ovum may occur in the absence of vitamin E, there comes a stage in development when the embryo collapses and disintegrates. W. Idell, Steenbock and van Donk (1928) found that a diet of 1 per cent. of ferric chloride in an adequate natural diet leads to destruction of vitamin E. It is possible that anti-substances may be associated with the other vitamins.

There is finally the vitamin-B complex, which is of especial interest in connection with the diseases beri-beri and pellagra. First there is the thermolabile anti-neuritic factor vitamin B<sub>1</sub>, absence of which from the diet of animals and birds, leads to symptoms of paralysis, associated with convulsions. There is also a second thermolabile factor according to Reader (1929), who claims that it is necessary for the growth of the rat. Williams and Waterman (1928) have, in addition, described a third thermolabile factor which is supposed to be necessary for the growth of pigeons but not of rats.

In association with vitamin B<sub>1</sub>, in many foodstuffs, such as yeast, there occurs a relatively thermostable factor, vitamin B<sub>2</sub>, absence of which from the diet of rats leads to dermatitis and to changes in the central nervous system. A condition resembling black tongue in dogs is also produced by a deficiency in this factor. Hunt (1928), on somewhat inadequate grounds, has described a second thermostable factor which he believes to be necessary for the growth of the rat.

In yeast there are also to be found two other substances which are of considerable interest from the point of view of nutrition. The first of these is bios, small quantities of which are apparently necessary for the growth of certain strains of yeasts in inorganic media. The second substance is one which prevents the onset of a curious disease in the rat, resembling pink disease in children. In 1927 Boas found that when young rats were fed on a diet in which the sole source of protein was dried egg-white, they developed a dermatitis and curious nervous symptoms. The pathology of this condition was investigated by Findlay and Stern (1929), who found that the pathological changes in the nervous system—round-celled infiltration into the cord and degeneration of the myelin sheaths of the

peripheral nerves—were indistinguishable from those occurring in pink disease in children.

The similarities between pink disease in children and this syndrome in rats may be still further emphasized. Both diseases occur in young animals. Pink disease has never been recorded in children above the age of 3½ years, while it is only after from three to five months on the diet of dried egg-white, that cutaneous lesions can be produced in the adult rat. Both syndromes may occur on a diet of mother's milk or on a ration containing all the known vitamins. The clinical symptoms of both diseases are nutritional, nervous and cutaneous. In rats there is a characteristic "kangaroo" position, in children a knee-elbow attitude. In both rats and children there is a curious mousy odour. Death is often due to an intercurrent bronchopneumonia. The disease in the rat may be cured or prevented by the addition of dried yeast—but not marmite—to the diet. Fresh, but not dried, liver also has a definite curative action. Pink disease has now been recorded in children in Australia, America, most European countries and South Africa. It is probable that it will be found in the tropics also.

The pathology of vitamin B<sub>1</sub> deficiency in animals differs in certain respects from that of human beri-beri, which, as is well known, occurs in three forms, the wet, dry and cardiac types, which, however, may not be sharply differentiated. In birds fed on a diet lacking in vitamin B<sub>1</sub>, there occur paralysis of the legs, wing-drop and finally, convulsive movements of the head, associated with opisthotonos. In rats there is also motor paralysis and in some cases convulsive seizures. Pathologically, there is found a myelin degeneration of the nerve-sheaths in birds, but not in rats. This myelin degeneration in birds appears to be associated with the general starvation rather than the lack of vitamin B<sub>1</sub>, for it is found in animals fed solely on marmite, which contains B<sub>1</sub>.

Generalized œdema and hydropericardium are not commonly met with in animals subjected to a deficiency of vitamin B<sub>1</sub>, but McCarrison (1928) has found that œdema together with hypertrophied right heart may occur in pigeons fed on a diet containing small quantities of vitamin B<sub>1</sub>. In America it has recently been found that rats fed on a similar diet have an increased water content of the tissues. The chief symptoms of human beri-beri can thus be reproduced in animals. The curious convulsive movements of birds on a diet lacking vitamin B<sub>1</sub>, however, are not seen in man. These convulsive movements are possibly a sign of anoxæmia, for they can be reproduced by the injection of sodium nitrite, or potassium cyanide, or by inhaling carbon monoxide.

It seems probable that in certain instances true beri-beri in man has been confused with two other conditions associated with œdema—nutritional œdema and epidemic dropsy. The former condition is probably due to some form of protein deficiency, but it has never been reproduced in animals, although it occurs regularly in man, in association with famine conditions, as in Russia in 1921. Epidemic dropsy is probably quite distinct from beri-beri, for it appears to be largely restricted to India, whereas beri-beri has been recorded from this country and is not uncommon among peoples who do not live upon rice at all. Epidemic dropsy does not occur in breast-fed infants, whereas the wet form of beri-beri does. Some years ago in the Philippines it was shown to be possible to produce the wet form of beri-beri in puppies by feeding them on the breast-milk of women whose children had developed beri-beri, although the women themselves had no signs of active beri-beri. It is difficult to imagine a toxin which could be excreted in the milk in such large amounts as to cause beri-beri in the children while leaving the mothers unaffected. It is simpler to suggest that there is in the mother's tissues a deficiency of some factor, the same deficiency being intensified in the milk.

In epidemic dropsy there is often an acute erythematous rash on the skin, while glaucoma has not



infrequently been described. Very frequently also, epidemic dropsy has an explosive onset. But if, as is suggested, this condition is due to a toxin formed from the rice, akin perhaps to that in ergot poisoning, it should not be difficult to obtain this so-called bad rice and to feed animals on it, thereby causing the typical symptoms even in the presence of vitamin B.

When rats are fed on a diet deficient in vitamin B, nervous symptoms do not occur, but there is a characteristic dermatitis, with a hemorrhagic discharge from the nose, and frequently the passage of blood in the urine. Pathologically, the changes in the skin and tongue of these rats are closely akin to those of human pellagrins. Changes are also found in the central nervous system of the rats, vacuolation and shrinking of the cells of the anterior horn, and later, the collection of lipochrome pigment (Stern and Findlay, 1929). Degenerative changes in the cord are not found, but neither do they occur in human pellagra until the case has become chronic.

Experimentally, therefore, a disease can be produced in the rat, unassociated with the eating of maize, which is not dissimilar to human pellagra.

Dr. H. B. DAY said that pellagra and beri-beri were not associated. Symptoms of pellagra did not occur in a case of beri-beri or vice versa, so far as he knew. Pellagra bore the same relation to the consumption of maize as did beri-beri to the consumption of rice. Much depended, apparently, on the vitamin deficiency.

He did not know how long pellagra had existed in Egypt; Sandwith had described its occurrence there in 1893, and found evidence that it had existed a considerable number of years. He (the speaker) placed it high in the list of the modern plagues of Egypt. All, or almost all, the theories in this discussion concerning beri-beri had been advanced in the case of pellagra. Opinion veered for a time between that of maize being a deficient diet for man, and the view that in damaged maize, owing to the growth of a fungus, toxins were produced which were responsible for the appearance of pellagra.

Shortly before the European War the infection theory of pellagra gained a number of adherents. This theory was suggested by the almost epidemic outbreak of pellagra which occurred in some of the Southern United States. Sambon sought for an insect transmitter, but no one had succeeded in transmitting the disease. Goldberger tried the experiment on prison volunteers, but did not succeed. The modern study of pellagra dated from the experimental school with food experiments on animals, from the opportunity that the spread of pellagra in America gave to the investigators there, and lastly, in Egypt from the circumstances of the European War, when pellagra occurred in conditions which could be controlled. During the war, a number of Turkish prisoners were assembled in camps near Cairo, and in those camps pellagra made its appearance. These men were kept on a known diet; the history of the patients could be taken, the progress of the disease observed, and measures of prevention or cure carried out. A special Commission was appointed in relation to it, and made a report. The clinical features of pellagra were well seen in this epidemic. The first symptom favoured the idea of an infectious origin, namely, diarrhoea. This had nothing very characteristic about it, as Dr. Manson-Bahr found, unless the disease was complicated by *Entamoeba histolytica* or other condition such as bilharzia. In some cases the stools resembled those in sprue; they were acid and highly fermentative. The general symptoms included weakness, mental depression, tenderness, etc., and then followed the rash, two to four months later, usually in the spring. He did not know whether that was because the actinic rays of the sun had then more influence. It could be regarded as an aggravated form of sunburn, and it corresponded to the experimental condition seen in rats.

At first the nutrition did not suffer, but the blood-pressure was distinctly lowered, being generally under 100 mm. The central nervous system was involved; the deep reflexes were increased at first, later they

might be lost. A slow degeneration of the cerebral centres was noted, and often progressed to dementia. Parotitis also might appear, with great chronic enlargement of the parotid glands, but he had no proof that this was solely due to the pellagra.

The cause of pellagra was connected with nutrition, chiefly of the ectodermal structures—skin, mucous membrane of the intestinal canal, and the central nervous system. The skin atrophy was chiefly seen in the parts which had been invaded by the rash. A case could be recognized as one of pellagra after the rash had gone. The tongue showed a glazed condition, much like the very clean tongues seen after scarlet fever. Deprivation of vitamin B led to atrophy of the intestinal mucosa and dilatation of the stomach, and it was probable that this mal-digestion and mal-assimilation of food completed the vicious circle initiated by the defective food. Pellagra was not so much an acute disease as a chronic condition.

The Pellagra Commission in Egypt devoted a good deal of attention to the biological value of proteins in the diet, calculated according to the amino-acid content. It was known that maize was deficient in tryptophane, that 102 grm. of maize contained the equivalent of 30 grm. of meat, and so one had to give far more vegetable protein. After the report was published some doubt was cast on it, because the Commissioners had relied on a comparison of the respective diets of Turkish and German prisoners of war. Turkish prisoners developed pellagra, but German prisoners did not. After the report was issued, however, pellagra broke out among German prisoners, though on a much smaller scale. In both cases an increased dietary stopped the outbreak and restored the patients.

Further work had been done on pellagra, especially by Goldberger in America, who found in asylums and other institutions in Carolina and Tennessee, where pellagra was endemic, that it might be prevented by a more liberal and varied diet, i.e., with the addition of meat or buttermilk. Butter and casein, however, had little effect upon it. Therefore it was suspected to be due not to a mere protein deficiency, but to the lack of a special constituent. By finding the preventive action of yeast, and its curative action in polyneuritis of birds, Goldberger was led on to the separation of the vitamin complex into B<sub>1</sub> and B<sub>2</sub>; because an 85 per cent. alcoholic extract of yeast would cure polyneuritis or prevent it, and animals, such as rats, which remained free from polyneuritis developed a condition of dermatitis resembling that in pellagra. The same worker studied the "black tongue" found in dogs fed on similar experimental diets.

On studying the subject it became clear that the problem in man was not the same as in animals; that each animal had a different liability to food deficiency. Pigeons could do without B<sub>2</sub>, but rats could not; and probably man had a different susceptibility from that of any of the animals used in experimentation.

Work had been done on the question of relation of the vitamins to the total protein consumption, and it had been suggested that a larger protein consumption needed more vitamin B than when the protein was cut down to a minimum. That might explain why there were vagaries in this condition. Vitamin B seemed to act in the body like insulin; it was required for the due assimilation of foodstuffs.

Dr. G. W. BRAY spoke of the occurrence of infantile beri-beri in the Mandated Territory of Nauru, in the Polynesian group of islands off New Guinea, under the control of the Commonwealth of Australia. In earlier years 50 per cent. of the infants died under the age of one year; in one year of his inquiry thirty out of sixty infants died in the first few months of life. The natives did not eat rice: they ate coconut products, fish, and native fruits. They were prohibited by the Government from consuming fermented liquors. For variety they ate tinned meats, oatmeal, and cornflour, substances which contained no "B" factor.

The diagnoses formerly made ranged from "stomach trouble" to marasmus and broncho-pneumonia



Usually the deaths occurred from the ninth to the eleventh week. They were fewest at times of greatest rainfall, so that there seemed to be a close relation to the food supply. The infants were brought with a history of vomiting and screaming, and then death would occur in about five minutes. In most of the cases the actual illness did not last longer than twenty-four hours. The first symptom was abdominal distension and vomiting, then the child passed into rigidity, convulsions and death. A chronic type was that associated with constipation. In the acute case there was a progressive gain in weight to a point, then the onset of the symptoms and death.

The substance found to be most beneficial in these cases was the yeast grown in the sap of the coconut palm. The use of this for babies had resulted, in three years, in wiping out the great death-rate.

With regard to the appearances, there was a huge liver, the stomach was markedly distended, and the heart greatly dilated, especially on the right side.

The blood-picture was that of a leucopenia. The small lymphocytes disappeared from the blood. The mother's milk was found to be deficient in fat. The curative sap, or "toddy," fermented, and a layer of yeast formed in the bottom of the vessel. It was emulsified with cod-liver oil and was administered to the children daily. Since this treatment was inaugurated there had been only one death from the disease, and the average weight was now 19 lb. at the age of 6 months, whereas previously it was 19 lb. at the age of a year, on the average. Moreover, the condition was formerly responsible for from thirty to forty admissions to hospital per month, whereas there were now no admissions due to this cause.

DR. TERTIUS CLARKE said that in his opinion there were two diseases. The disease encountered in Malaya was true beri-beri; the disease seen in India was not. Dr. Findlay had said this evening that dry beri-beri was rare, but in his (the speaker's) experience, in Malaya it was common. An appropriate diet completely checked it. It had been rife in the jails, but when parboiled rice was given in place of the polished rice, it ceased. Unless the patients in hospital were practically moribund, their recovery on the appropriate diet was very rapid, though it had no effect on the residual paralysis. He did not think that for bringing about a cure it was essential to have actual parboiled rice; any rice which was not polished would prevent the disease. Kedah was a rice-producing country, without any importation of it, and there was no beri-beri. The rice was not polished or parboiled. The nationalities in Kedah were the same as in other parts of Malaya, namely, Malay, Chinese and Tamil.

The Norwegian worker, Holst, said—and it was true—that in every acute case of beri-beri examined after death, a duodeno-enteritis was found, and sometime there was inflammation of the stomach as well. Possibly the intestinal lesion was secondary to the nerve lesion, and any further lesion entirely secondary.

With regard to the theory of endocrine irregularity, there was the significant point that if one took a group of forty or fifty cases and changed their diet, the disease disappeared.

DR. W. R. AYKROYD said he had recently observed cases of beri-beri in people who were on a staple white-flour bread; that was, beri-beri as it occurred in Newfoundland and Labrador. In those countries the disease was never regarded as different from the tropical rice-eaters' variety. For practical purposes the two diseases seemed to be identical. As seen in the countries he named, beri-beri might be defined as a polyneuritis associated with myocarditis, and occasionally with oedema, which occurred in people suffering from malnutrition, and responded to dietetic treatment. For three or four months each year the diet of sufferers was almost restricted to refined white-flour bread, with the very small addition of such foods as salt meat (beef and pork), molasses, and one or two other minor articles of food. In Newfoundland and Labrador one found beri-beri in the poorest families; it was a poverty disease. In the more northerly parts of the country

the people had to buy enough food in December to last about six months, for during that time they were practically marooned. Those who were reasonably well-off bought, in addition to flour, other foods to give variety, such as turnips, onions, potatoes, etc. The seasonal incidence of the disease was very clear-cut, most of the cases occurring in April, May and June, the worst dietetic period of the year; few cases occurred in late summer and autumn, when fresh fish and meat were available. The question of bad flour as a possible factor in beri-beri did not arise in those parts, because wheat flour did not readily deteriorate, and the whole population was supplied with much the same kind. The fact that obvious beri-beri occurred on a white-flour staple was strong evidence of the truth of the deficiency theory.

With regard to the exact relation of beri-beri to deficiency of vitamin B<sub>1</sub>, the disease as he saw it in North America, confirmed such relationship. In 1912 Little, who worked there, observed that at one part of the coast a cargo of whole-meal flour was wrecked, and the people obtained possession of this flour and used it. In that season beri-beri had shown a tendency to disappear in that region. People who had a good supply of potatoes seldom had beri-beri, and potatoes contained a fair amount of vitamin B<sub>1</sub>. In Labrador, where the people were poorer, beri-beri had always been comparatively rare, because a supply of fresh meat was usually available; fresh meat, a source of the vitamin, seemed to check the onset of beri-beri. Treated on a proper diet containing excess of vitamin B<sub>1</sub>, a sufferer from beri-beri would usually be fit for work in four months. In his experience, wheat-germ and yeast could be given to patients without producing much effect, unless an all-round improvement was made in the diet. When a patient had been on a diet generally deficient, as were most beri-beri-producing diets, he would be more likely to respond to a good all-round diet than to a vitamin concentrate.

Most of the cases of beri-beri in the countries he had mentioned were of the dry form. Possibly the wet form was beri-beri plus hunger oedema, a condition perhaps due to protein deficiency.

There were a few points which could not be explained on the deficiency theory. One was the immunity of children between the ages of 2 and 15 years to beri-beri. Another was the occasional occurrence of cases of what seemed to be beri-beri under conditions of a fair diet. These cases were very rare. In the majority of cases the relationship to faulty diet was very clear-cut.

DR. H. S. STANNUS asked if Dr. Findlay would give some idea of the way in which food deficiency produced the symptoms. Was it not possible that the deficiency of an accessory food factor might unmask some definite physico-chemical action, i.e., in the absence of some vitamin, some substance from within or without the body might act as a toxin? The onset of rickets was facilitated by giving oatmeal in large quantities. He would also like to hear the explanation, in the acute beri-beri in children, of what happened at the moment on onset of acute symptoms, the child "screamed, vomited, and died." He did not understand how the absence of anything could produce such symptoms, which resembled rather those of an acute toxæmia.

He was familiar with pellagra, and the changes in the nervous system in that disease were comparable with those seen in toxic conditions, as shown by Kinnier Wilson in material he had sent him from Central Africa. It was suggested that the toxin entered the nervous system along the posterior root-sheath lymph channels.

He wondered whether different species of animals made use of different amino-acids. Was it reasonable to suppose that individuals of a particular tribe or race who had subsisted on a particular diet since childhood, made use of only certain amino-acids, and that if the diet were changed disease might result? Some natives went sick when their diet was changed, apart from the question of vitamins.

DR. J. KINGSTON BARTON said that it was the custom in many tropical countries to keep children to the breast

until they were one or even two years old. Could Dr. Bray suggest why the breast-fed children in Polynesia should have failed so soon? He (the speaker) supposed that the breast-feeding in those cases, owing to the poor condition of the mother, was practically continuous starvation.

Dr. BRAY, in reply to Dr. Kingston Barton, said that the children had not shown any rise of temperature, and their motions had been normal. There was diarrhoea, but the blood-picture did not fit in with that of a toxæmia, as there was leucopenia affecting only the small lymphocytes. In most of the cases investigated, the diet of the mother had been mere sugar-water; she would drink 1½ pounds of sugar in water per day without eating native food. The consumption of huge quantities of this sugar-water caused a polyneuritis. After the use of the "toddy," which he had mentioned the symptoms would sometimes clear up within an hour, and the child begin to thrive. Toddy had been disallowed by the Government, but it was reintroduced, though with the proviso that it must not ferment for long. No infantile beri-beri had been reported as occurring in the island for the last three years, and the infant mortality had been reduced from over 400 per 1,000 births to about 70, which was not much worse than the figure for England. Steps had now been taken to restrict the use of so much sugar.

White flour was not sold in any native stores, and polished rice was not allowed to be sold, but the stores were required to keep brown rice with a phosphorus content, and wholemeal flour and bread were used on the island.

Dr. J. B. CHRISTOPHERSON (Chairman) remarked that Dr. Stannus's work had been done in Nyasaland, where he (the Chairman) thought there was a good deal of pellagra. His own experience of tropical diseases had been in the Sudan, where pellagra was seldom met with, though in the neighbouring country of Egypt pellagra was one of the national diseases, and one of the most serious. In the Sudan, millet was the staple food, and in Egypt, maize. He would like to know how Dr. Stannus accounted for the amount of pellagra in Nyasaland.

Dr. STANNUS (in reply to the Chairman) said that the outbreak of pellagra in Central Africa which he had investigated was in a prison, in which the ration consisted of rice and salt. There was an arrangement in regard to the prisoners whereby some of them were allowed visits from their wives. Among the prisoners who had their wives in attendance the sick-rate was much less than among the other prisoners, and the only explanation which seemed to account for it was that the wives were allowed to take the rice and salt ration away to barter for other varied articles of diet, which were then supplied to their prisoner husbands. Pellagra occurred among those who ate little but rice. The prisoners' ration was a poor one in every respect.

Reverting to Dr. Bray's remarks, he suggested that the milk of mothers on a diet of sugar and water might have been toxic, and so produced the acute condition in the infants in the absence of the vitamin.

Dr. G. W. THEOBALD said that, with regard to Professor Megaw's naive statement that whatever the cause of beri-beri might be, the treatment was simple, and merely consisted in prohibiting rice and giving a varied diet, he (the speaker) had found that "simple treatment" impossible in practice. He had seen a considerable number of cases of beri-beri, all associated with pregnancy. They were of the dry type, with one exception, and all improved on the ordinary diet and vitamin B. The patients did not suffer from any dilatation of the heart, or cardiac symptoms. He did not see any fundamental difference between that form of beri-beri and the kind produced in pigeons by McCarrison and other workers. What impressed him most was that Siam, the third greatest rice-exporting country in the world, and one which existed on the revenue from its rice, should have to polish it for the London market. The prodigal son "would fain have filled his belly with the husks that the swine did eat."

In modern Siam, the Government would fain fill the bellies of their people with an expensive extract from the husks which were, indeed, given to the swine to eat. It was true to say that the London market was the cause of beri-beri in Siam. He earnestly hoped that some authority—perhaps the League of Nations—would tackle this and similar urgent problems in the near future.

MAJOR-GENERAL MEGAW (in reply) said that Dr. Aykroyd had told him privately that he had seen a condition resembling epidemic dropsy among people who did not eat rice.

Dr. Findlay said that infantile beri-beri could be explained more readily as a deficiency in the mother's milk than as due to the excretion of a toxin in the milk, but he saw no reason why a toxin should not be excreted in the milk of the mother. In epidemic dropsy he had not seen anything which could be called a true rash; there was sometimes a vascular mottling on the surface of the skin. He had seen this condition described by Japanese writers as being common in beri-beri. Glaucoma did not occur in beri-beri, though French writers described a scintillation of the eyes and dimness of vision. It was true that epidemic dropsy usually occurred as an explosive outbreak, but it was not always so, and, not infrequently, beri-beri also appeared as a definite outbreak.

Dr. Findlay had placed his finger on the weak spot in the argument in favour of epidemic dropsy being an intoxication when he asked why we had not found the toxins. He (Major-General Megaw) suggested that these toxins were very elusive, not only in this but in many other diseases. In epidemic dropsy the manifestation was not seen until several days after the food had been taken; often the patient had been taking small quantities of the poison over a long period. It was difficult to get samples of the rice which was the cause of the illness as the rice had often been consumed before the disease was recognized. The cause could not be said to be vitamin deficiency, because the patients had been eating a diet which was satisfactory in all respects.

With regard to the analogy between beri-beri and pellagra, here were two deficiency diseases, each closely associated with the eating of a certain article of food. He had been surprised to hear Dr. Stannus say he had come across an outbreak of pellagra among people who were eating rice, as something like 95 per cent. of the cases of pellagra occurred in eaters of maize, while at least 95 per cent. of the cases of beri-beri were in rice-eaters.

He did not know how to account for the infantile beri-beri in Polynesia, but the description given by Dr. Bray showed that it had been carefully studied, and if such studies were carried out often, an accurate knowledge of disease processes would be more quickly obtained. Probably the gastro-intestinal irritation referred to by one speaker was an early manifestation of beri-beri; its occurrence suggested that an irritant toxin entered the body through the gastro-intestinal mucous membrane.

Dr. FINDLAY (in reply) said that those who still believed that beri-beri and pellagra were due to toxins produced from bad rice and maize were faced with the difficulty that these diseases sometimes occurred in people who did not eat rice or maize. It would be necessary, therefore, to imagine the characteristic toxin from rice or maize formed in association with entirely different foods.

With regard to the question of a toxin in the milk in infantile beri-beri, there was no evidence that in a disease such as ergotism any toxins were excreted in the milk by which the suckling child could be affected. In scurvy, on the other hand, it was well known that the young could be affected by a deficiency of vitamin C in the mother's diet, and the same was almost certainly true of beri-beri. Dimness of vision which sometimes occurred in association with beri-beri, was probably due to lack of vitamin A, in which rice was also deficient.

In reply to Dr. Stannus, it was not known how vitamin B<sub>1</sub> acted. There was evidence to show that

metabolism was interfered with by its absence in a number of ways. The metabolism both of proteins and fats appeared to be affected, possibly there was anoxæmia or a change in the oxidation reduction potential of the tissues. There were, at any rate, many ways in which a toxin might be formed in the body as the result of faulty metabolism.

With regard to the production of definite skin changes by vitamin B<sub>2</sub> deficiency, it had been known for many years that pellagrins were more sensitive to sunlight than ordinary people. It was not sensitization to ultra-violet light in the way that hæmatoporphyrin caused sensitization, because any stimulus would cause the onset of dermatitis. In the United States there had been cases in which exposure to X-rays had precipitated a pellagrous dermatitis. Pressure would give the same effect; a person wearing a tight belt showed dermatitis on the pressure area. Thus there was an increased sensitivity to stimuli and liberation of some substance resembling histamine, which set up the vascular reaction and the subsequent desquamation.

DR. J. B. CHRISTOPHERSON (Chairman) said that the problem of these diet-deficiency diseases, beri-beri and pellagra, was most important to countries like India and Egypt. It was to be hoped that when India and Egypt gained that measure of political independence which they sought, they would not lose sight of these great medical questions, but would carry on and extend the investigations into those problems which had been pursued, with native help, with such success in the past.

### The Rubino Reaction in Leprosy.

By C. RUSSELL AMIES, M.B., B.S., D.T.M. & H. (Eng.).  
(*Bulletins from the Institute for Medical Research, Federated Malay States, No. 4 of 1929.*)

INTEREST in the erythrocyte sedimentation test in the diagnosis and prognosis of leprosy has very much increased during recent years, and the publication of this brochure marks an important step forward in this matter. The author commences with a brief and useful historical summary of the subject, then gives the details of the Rubino test, which uses formalinised sheep's red corpuscles instead of the patient's, plus the patient's serum. He then discusses the results obtained by previous workers with this test; thus Marchoux and Caro obtained 80 per cent. of positive reactions in 800 lepers, whereas Paullier and Errecart, also Peltier, obtained variable results, and concluded that the test had no practical diagnostic value.

The author found that the addition of 10 per cent neutral formaldehyde led to the clotting of the washed sheep's corpuscles into a firm jelly. His modification of Rubino's test is therefore as follows:—Sheep's blood is collected and immediately defibrinated; then by repeated washing with normal saline followed by centrifuging the red cells are completely freed from serum. Each batch is tested for auto-agglutination and any specimen showing a tendency to clump spontaneously discarded. Formaldehyde is added to make a 6 per cent. concentration of formaldehyde, and sufficient N/10 sodium hydroxide solution to bring the pH to 7.4. The formaldehyde solution is added to the washed sheep's red corpuscles to make up the original volume of blood taken, and this suspension left at room temperature (78°F.) for 24 hours. The formaldehyde is then pipetted off, and the cells, which have changed to a chocolate colour, are repeatedly washed and centrifuged in 0.85 per cent. saline. Finally, the original volume of blood is obtained by the addition of saline, and the suspension stored in an ice chest. Two such suspensions, prepared from different sheep, were used for each test. To carry out the test, 1 c.c. of the patient's serum is pipetted into each of two small test tubes, 3 × 3/8ths", held vertically in a metal rack. To each tube is then added 0.2 c.c. of one of the sheep's red cell suspensions. The tubes are thoroughly shaken and then placed in the 37°C. incubator. They are

examined at half hour intervals and the degree of sedimentation recorded as the height of the clear fluid above the cells in millimetres. If complete sedimentation occurred within the first half hour of incubation, leaving a perfectly clear serum above, the reaction was read as positive.

The sera of 353 cases of leprosy and of 287 controls were tested by this method. The Wassermann and Kahn tests were also performed on all these sera, but the co-existence of syphilis appeared to have no effect on the Rubino reaction. Lepers suffering from pulmonary tuberculosis were excluded from the series.

Results show that a positive Rubino reaction is only given by cases of leprosy in the active state. The test is therefore of more value in prognosis than in diagnosis. Its chief value is in the control of treatment; to know when to give intensive courses, and when to lessen inoculations. Of the sera of 353 lepers tested, 89 gave a positive reaction. Of the 287 controls 16 gave positive test, viz., 9 cases of tropical typhus, 2 of pregnancy, and 5 miscellaneous. In two patients, however, a positive Rubino reaction led to a diagnosis of leprosy.

With regard to the nature of the reaction, the author discusses various theories which have been put forward; the evidence shows that the speed of agglutination is in proportion to the albumin : globulin ratio in the blood. The globulin content of the serum is well known to be considerably increased during the active phases of leprosy; and the author shows that, whereas the normal ratio of serum albumin : globulin is 3.2 : 1, in leprosy it is often 1 : 1.3 or even higher. The non-protein nitrogen is also considerably increased in cases showing a leprosy reaction. If the globulins are removed from leprosy sera, however, the Rubino reaction with the serum after treatment becomes negative.

Heating the leprosy sera to 56°C. and even 60°C. for one hour did not affect the reaction, which shows that complement cannot take any part in it. Red corpuscle suspension washed absolutely free from all traces of formaldehyde gave identical results with the formalinised suspensions, so formaldehyde is not responsible for the reaction. The most clear-cut reactions were obtained at a pH of 7.4, but the addition of acids or alkalis only slightly affected the sedimentation rate, alkali slightly retarding, and acids slightly accelerating it.

The advantages of the Rubino test are: (i) that the standardised formalinised suspension of sheep's red corpuscles obviates errors and the suspension can be used over a period of months; (ii) by using the patient's serum instead of plasma variations in the fibrinogen content of his blood can be excluded; (iii) the patient's serum can be sent to a distant laboratory to be tested; and (iv) the principle of using a formalinised sheep cell suspension can be applied to any of the well known techniques in which graduated tubes are employed.

A list of 32 references to the literature, which laboratory workers on the disease will find distinctly useful, completes the report.

### Liver Treatment in the Pernicious Anæmia of Pregnancy.

By R. PATERSON, M.D.,

H. FIELD, Jr., M.D.,

and

H. S. MORGAN, M.D.

(Abstracted from *The Journ. Amer. Med. Assoc.*,  
March 22nd, 1930, Vol. 94, No. 12, p. 839.)

IN this communication we shall deal with that form of anæmia occurring during pregnancy or the puerperium not due to hæmorrhage or directly related to infection but, apparently, in part at least, dependent on the pregnancy itself.

The condition has frequently been termed the pernicious or the hæmolytic anæmia of pregnancy. Esch and Larrabee have pointed out that two distinct types

of anaemia occur in association with pregnancy. In some there is a low color index and the blood picture of a secondary anaemia. These cases have a good prognosis.

The majority of reported cases, including those here under discussion, afford justification for the names given the condition by their close resemblance to primary pernicious anaemia, and seem to form a distinct group. The anaemia is severe, often fatal. The color index is high. There is a high grade poikilocytosis and anisocytosis with megalocytes and frequently megaloblasts. The blood bilirubin is increased.

In distinction to primary pernicious anaemia, the macrocytosis is less marked. The leucocytes are more frequently normal or increased in number. If recovery occurs, there is little tendency to a relapse. A few instances have been reported in which there has been a recurrence associated with subsequent pregnancies—Vermelin and Vigneul, Murdock and Allan.

A further difference which has hitherto not been emphasized is the fact that there is not necessarily an associated achlorhydria. Free hydrochloric acid was demonstrated in the gastric contents in each of the three cases here reported.

A portion of the reported cases have been seen with a severe anaemia during the later months of pregnancy. Usually the anaemia has not been discovered until the puerperium. Frequently there has been a rapid progression of the disease soon after a premature delivery. In some instances there has been a gradual progression for weeks or months post partum.

It is of interest that the disease is apparently much more common in India than it is among Caucasians. Although, with increasing knowledge of it, reported cases have become more common in Europe and America, it remains a rare condition. In 1927, McSwiney reported forty-three cases observed among 2,544 maternity patients in Calcutta—an incidence of 1.69 per cent. At the same time, Balfour reported 150 cases seen in Bombay in one and one-half years. This marked difference in incidence may afford a clue as to aetiology. We are not sufficiently acquainted with conditions in India to draw conclusions.

In the past, the prognosis in such an anaemia has been very poor. Minot, from the figures given by Esch and Peterson, estimated that the mortality was about 65 per cent. More recently there have been great additions to our therapeutic armamentarium.

The great improvement in the pernicious-like anaemia of the puerperium which frequently follows transfusion has been described before. Schmidt reported two cases seen in consultation with one of us (R. P.) in 1915. These were of puerperal type and were treated by direct transfusion. The patients were apparently well one year later. Reist, in 1926, reported two cases and collected reports of fourteen others from the literature, which had been treated by transfusions of significant size with a mortality of 25 per cent. The four patients that died had received only one transfusion each. Of four who received more than one transfusion, none died. Gallune and O'Hara reported two striking cases, in which there was more than the usual fever. Following a single transfusion there was an almost crisis-like drop in the temperature to normal and subsequent steady improvement. Such prompt results after one transfusion are not always obtained. In one of Reist's cases there was a high fever and unfavourable progression which continued until after the fourth transfusion.

One may conclude that most cases of the anaemia occurring during the puerperium will respond satisfactorily if given the advantage of a sufficient number of transfusions. It would seem, however, that transfusions will not be necessary in the future except as an emergency measure. Murdock made the prediction that many cases would be successfully managed on a liver diet.

Three cases have been reported—Deschamps and Froyez, Audebert and Fabre and Brault—in which the

anaemia occurring during pregnancy has been successfully treated by the liver diet, in two instances combined with transfusions.

Liver seems to exert a specific influence in this condition similar to that exhibited in primary pernicious anaemia. Patient 1 continued to improve as long as liver was fed and began to relapse when it was omitted during the continuation of the pregnancy. In Case 2, in which no transfusion was given, the reticulocyte crisis seven days after an adequate liver intake was instituted, associated with a decrease in the high blood bilirubin to normal and followed by a steady increase in the haemoglobin and red blood cell count, is entirely analogous to the effect obtained by similar treatment in primary pernicious anaemia, as described by Minot and Murphy. Previous observations do not permit conclusions as to whether the great bone marrow activity indicated in Case 3 by the increase in the reticulocyte count from 3 per cent. to 37 per cent. is greater than might be obtained by transfusion alone and therefore ascribable to the liver extract. Certainly it is a very striking result.

These observations may throw some further light on the character of these pernicious-like anaemias associated with pregnancy. They may be taken as a further answer to the frequently discussed problem of the relation of these anaemias to pregnancy. Liver treatment has frequently been tried in secondary anaemias with no such specific effect being observed (Brill, Middleton).

That we were not dealing with primary pernicious anaemia is indicated by the presence of hydrochloric acid in the gastric contents, the slight or absent macrocytosis, the absence of secondary symptoms characteristic of pernicious anaemia and the absence of relapse in the, to be sure, rather short period of observation.

A study of the bone marrow in this condition like that carried out by Peabody in primary pernicious anaemia would be of great interest. The similar response to treatment with liver suggests that a similar abnormal type of blood regeneration might be found.

Case 1 is of especial interest in its bearing on the treatment of cases in which the anaemia is observed before the puerperium. We have found no evidence in the literature of any notable improvement occurring without liver treatment in such a case before the termination of pregnancy. It is conceivable that, with a sufficient number of transfusions, pregnancy could be continued until a viable foetus would be obtainable. The number of such transfusions might, however, need to be enormous. Blood destruction may be extremely rapid, as indicated by one of Reist's cases. In this case the anaemia was greater after three transfusions than it was before the transfusions, totalling 1,600 c.c. of blood in six days.

The liver treatment in Case 1 relieved but did not cure the condition during the pregnancy. Although there was a marked improvement in the anaemia, the blood bilirubin was 14.5 mg. per thousand cubic centimeters seven days after the beginning of the liver diet, and the patient remained icteric until the treatment was again instituted after delivery. After the liver was omitted from her diet there was a gradual increase in the anaemia during the remainder of the pregnancy. It would seem that the treatment had made possible a more normal type of blood regeneration but had not affected the underlying cause.

There are not yet sufficient observations to permit the conclusion that this will be the usual course of events. In two of the reported cases in which the liver diet was discontinued for some time before delivery there was no significant increase in the anaemia. Information concerning the rate of haemolysis in these cases is not given.

Attention should be called to the possible danger associated with a high liver feeding during pregnancy when there is a tendency toward nephritis or toxæmia. It is not our purpose to enter into a discussion of the aetiology of the toxæmias of pregnancy. The belief in a relationship to protein intake is widespread. Newburgh and Curtis have reported that, of all the proteins tested, liver was the most nephrotoxic to white

rats. During such feeding in Case 1, an albuminuria with casts developed and the blood-pressure increased to 170 systolic and 100 diastolic. One cannot exclude the possibility of other factors operating in the subsequent gradual diminution of the blood-pressure to 140 systolic and 70 diastolic in the six days before delivery, following the omission of liver from the diet, but the time relation is suggestive. We would recommend especially careful observation of the urine and blood-pressure when a high liver diet is used during pregnancy.

Case 3, although complicated by the initial transfusion, affords some evidence that liver extract may be as efficacious as liver. If so, it would avoid the danger emphasized and would be the most desirable treatment during pregnancy. Since liver extract has become available to us, we have not seen such a case in which its effect could be tested.

#### *Summary and Conclusions.*

Three cases of the pernicious or hæmolytic anæmia of pregnancy have been treated with a high liver diet or liver extract. Although the situation was complicated by transfusions in two cases, the response to liver treatment seems to have been quite analogous to that obtained by such treatment in primary pernicious anæmia. One patient was relieved by the treatment but did not become well until after the termination of pregnancy.

In all these cases, free hydrochloric acid was demonstrated in the gastric contents.

### **Idiosyncrasy to Quinine, Cinchonidine and Ethyl-Hydrocupreine.**

By W. T. DAWSON, M.A.,

and

F. A. GARBAGE, B.A.

(Abstracted from *The Journ. Amer. Med. Assoc.*,  
March 8th, 1930, Vol. 94, No. 10, p. 704.)

ONE of us (F. A. G.) has an idiosyncrasy demonstrable by Boerner's test, to quinine, and also to a number of other alkaloids of the cinchona group: namely, cinchonidine, hydroquinine, hydrocinchonidine, cupreine, hydrocupreine, ethylquinitine, ethylcupreine (optochin). All of these compounds are levorotatory; their solutions cause rotation to the left of a beam of polarized light. Idiosyncrasy is not present to the dextrorotatory isomers of these substances.

The idiosyncrasy was discovered through the oral administration of a capsule containing 5 grains (0.325 gm.) of quinine sulphate, April 25, 1929. This was the first time the subject had taken quinine. Within ninety minutes cinchonism appeared, characterized by dizziness, tinnitus, nausea and vomiting. About ninety minutes later, symptoms of quinine idiosyncrasy were marked—intense urticaria, alarming dyspnoea and abundant nasal discharge. Within three hours more the violence of the reaction had considerably abated, and ninety minutes later the only traces were some areas of erythema.

Application of Boerner's test for quinine idiosyncrasy has given positive results with the eight levorotatory alkaloids already listed. The test was carried out as follows: A forearm skin area was sterilized with 70 per cent. alcohol. Light scratches were made with a needle. To these were applied solutions of 1 per cent. strength of the alkaloids usually and 10 per cent. on some occasions. When an alkaloid was not available in the form of a readily soluble salt, the sulphate or alkaloid itself was dissolved in water with the aid of dilute hydrochloric acid. Care was taken to avoid excess of acid, as neglect of this precaution has been found to result in the obtaining of false positive reactions in sixteen normal subjects. A positive test consists in the appearance in from eight to fifteen minutes of a wheal with a surrounding zone of erythema. The wheal remains fifteen or twenty minutes, the erythema a little longer. A typical "positive" may be obtained in normal persons simply by applying 10 per cent. hydrochloric acid to a scratch in the skin.

The results of the skin tests were further checked by oral ingestion of quinine (234 mg. of alkaloid dissolved in hydrochloric acid) and cinchonine alkaloid (234 mg. in capsule). These are dextrorotatory alkaloids; they gave negative results with the skin tests and caused no symptoms of any kind on oral ingestion of the doses prescribed, which are approximately equivalent to the alkaloidal content of 5 grains (0.325 gm.) of quinine sulphate. Oral ingestion of one-half grain (32 mg.) of cinchonidine alkaloid (medicinal grade) caused a reaction almost entirely similar to that with quinine sulphate, but slighter. Ingestion of one-tenth this quantity of quinine alkaloid (3 mg.) did not cause a systemic reaction. It was not considered wise to try the effects of ingestion of ethyl-hydrocupreine in any dose as this drug has caused in a number of cases very severe visual disturbance, more or less lasting. About the side-effects of the other alkaloids little is known, and experimentation was considered extremely incautious.

On the suggestion of Dr. M. L. Graves, the effect of epinephrine on the skin test was observed. Hypodermic injection of 4 minims (0.26 c.c.) of epinephrine hydrochloride, 1 : 1,000 solution, did not prevent or delay appearance of typical positive skin reactions to 1 per cent. quinine hydrochloride solution applied twenty-one and thirty-four minutes later. Marked "gooseflesh" was present at the time of both applications.

## **Reviews.**

**KRANKHEITEN UND HYGIENE DER WARMEN LANDER. EIN LEHRBUCH FÜR DIE PRAXIS.**  
Third Edition, completely revised. By Ruge (Reinhold), Mühlens (Peter) & Zur Verth (Max) 1930. Georg Thieme, Verlag, Leipzig. (Paper M 39. 60: Bound M-42)

THE first edition, which was published in 1912, was a moderate volume of 444 pages, just enough to give the young doctor proceeding to foreign countries the necessary working knowledge of diseases unknown in the temperate climates. The present volume, which succeeded quickly the second edition (1926), gives a good account of the amazing work and progress done in tropical medicine during the last 20 years. Although only 50 pages are added (the size of them was also increased) the present copy contains new chapters on smallpox, tularæmia, cholera, rhinocleroma, trachoma, various tropical skin diseases, and the cosmopolitan helminths. A special feature of the book is the very well selected illustrations including several excellent coloured plates.

The book is divided in two parts, the first dealing with tropical hygiene in general, the second with the various groups of diseases peculiar to the warm climates; this second part is subdivided into the usual groups of infectious diseases, those caused by helminths and arthropods, skin and venereal diseases, animal and vegetable poisons, tropical surgery and cosmopolitan diseases. Special sanitation and hygienic necessities are discussed in the respective chapters (malaria, yellow fever, etc.).

The recent new additions to the therapeutic armamentarium which are mostly due to German synthetic chemistry, plasmoquine and neostibosan, for example, are mentioned in detail. But we regret to miss several important findings, which would have deserved mention in a book of this standing. We have in mind especially Muir's work on the pathology of leprosy, which gives the whole of this disease a quite different outlook, and we would have preferred to place this disease not under the heading "skin-diseases." Also Lloyd's and Napier's work on the serology of kala-azar is too important to be omitted, just as is Fletcher's research on tropical typhus in Malaya.

But apart from these suggestions, which we hope will be taken up in the next edition, the book is



packed with reliable information and can be recommended to anyone familiar with the German language. We regret, however, that the price of a copy is a rather severe drain on the average practitioner's purse.

O. URCHS.

**DISEASES OF THE THYROID GLAND.**—By A. E. Hertzler, M.D. Second Edition. Entirely Rewritten. St. Louis: The C. V. Mosby Company, 1929. Pp. 286 with 159 illustrations. Price, \$7.50 net.

DR. HERTZLER appears to have very decided theories about the ætiology of goitre, though it is rather difficult to follow exactly what they are. In his very short chapter on this subject he does not expatiate at any great length on his own theory and little more than mentions the various theories, deficiency, bacterial, toxic, etc., of other observers; in fact the chapter is rather inadequate. However, untrammelled by theory he proceeds to give a very good account of the histology of the normal thyroid and the pathology of the various pathological conditions of the organ. These two sections constitute the best part of the book. He then deals with symptomatology, diagnosis, prognosis and treatment. Here, he is not at his best; his never-mind-what-the-Big-Boys-say-I-know-better style is rather irritating. There is a chapter on hospital management of the goitre patient by another writer (Dr. Victor Chesky), and one on surgical technique which is very well illustrated. In fact the illustrations throughout the book are very good indeed.

Dr. Hertzler seems to congratulate himself on being able to work in comparative isolation at Halstead. His book gives the reviewer the impression that he has suffered very considerably from the isolation. It is, however, a book in which there is very much valuable information on a subject of which the author has had very considerable practical experience.

The printing, paper, illustrations and binding of the book are excellent, and we can conscientiously recommend it to the specialist.

**MALARIAL NEPHRITIS.**—By George Giglioli, M.D. (Italy). D.T.M. & H. (Eng.). Pp. 164 with 17 illustrations. 1930. London: Messrs. J. & A. Churchill. Price, 8s. 6d.

THE publication of this book is an important event in the history of the study of malaria, for it is the first really detailed contribution to a most difficult subject for several years. The book is one which should be read by every malariologist, and above all by those who have to deal with blackwater fever. Dr. Giglioli has been for seven years Chief Medical Officer to the Demerara Bauxite Co. in British Guiana, and the book is packed with useful and often novel information, epidemiological and clinical notes on the malaria of British Guiana, on blackwater fever, and albuminuria and nephritis in malaria, based on seven years' observations in a tropical climate.

Part I of the book deals with the epidemiology of malaria in British Guiana. The country consists of the coastal alluvial plain, and sand-hill zone, the mountainous zone, and the savannahs of the far interior. It is traversed from South to North by several large rivers. The population is an exceedingly mixed one, comprising East Indians in the majority, aboriginal Indians, negroes, mixed races, Portuguese, Chinese, and Europeans other than Portuguese. The typical population of the rivers are the 'Bovianders,' a mixture of European, South American Indian, and negro blood. In the conclusions to this part the author writes as follows:—

"1. Malaria is hyperendemic in the river areas of the interior of British Guiana.

2. All three types of parasite are found. In a series of 1247 positive blood films, 81.4 per cent. showed *P. vivax*, 15.7 per cent. *P. falciparum*, and 2.9 per cent. *P. malariae*.

3. The incidence of *P. malariae* is in reality very much greater. While relatively rare in hospital,

*P. malariae* is found commonly in house to house survey. (In brief, patients with quartan malaria are often only so mildly ill that they do not come to hospital.)

4. The reported vector of malaria on the coast is *A. tarsimaculata*, whose breeding sites are situated in grassy swamps, clogged drains and trenches, in open country in both sweet and brackish waters.

5. The vector of malaria in the interior is *A. argyritarsis*, which breeds in forest-covered swamps and puddles and tends to congregate in houses.

9. On the great flood rivers like the Essequibo *A. argyritarsis* is also the vector. Its breeding sites are found in the myriads of small puddles and temporary swamps left by subsiding floods..... High flood and high temperature would appear as the most dangerous condition on the mid-Essequibo. Local rains have little or no importance. Droughts in the interior, by affecting the floods, bring healthy years.

11. With an exact knowledge of local conditions and by a careful systematic study of meteorological data throughout the colony, it is possible to forecast by some weeks, or even months, the greater or less gravity of the seasonal malarial outbreak. (The chief malarial season is from September to December, following the autumn rains.)

12. Clinically, quotidian intermittent fevers are the commonest form observed; 82.9 per cent. in 1,074 fever charts.

13. Pernicious syndromes are relatively rare; more common in children, in whom convulsions are frequent, and often associated with very heavy *P. vivax* infections. (This last point is noteworthy.)

14. Extreme chronicity intensified by continual reinfection and super-infection, leading to a veritable malarial saturation, constitutes the main clinical characteristic of the disease on the tidal rivers of Guiana."

In Part II the author turns to a study of blackwater fever, as seen in the interior of British Guiana. Here we may again quote in part from his conclusions:—

"1. During seven years' observation (1922 to 1929) in the interior of British Guiana.....fifty-six cases of blackwater fever were observed.

2. The disease was absent during the years in which malaria was mild; it appeared as a rather rare condition in years of average malarial severity; it became very common after an epidemic which prevailed amongst the population of the tidal rivers during the latter months of 1926.

3. The epidemic curve of blackwater during the period of observation did not coincide with the curve of malaria. The apex of the former occurred ten months after that of the latter.

4. In the interior of British Guiana benign tertian malaria accounts for 81 per cent. of all malarial infections.

5. *P. vivax* was found in the blood of 26.8 per cent. of blackwater cases, *P. falciparum* in 7.1 per cent., negative results were returned in 66.1 per cent.

6. Negroes present a remarkable immunity to the disease. This does not appear in the form of acquired immunity..... Among 1,854 negro patients the incidence of blackwater was 0.4 per cent.

7. Blackwater in the interior of British Guiana is most prevalent amongst the permanent riverine populations, constituted mainly by people of mixed blood (Bovianders) and aboriginal Indians..... In a total of 1,037 patients of mixed race the incidence of blackwater was 3 per cent.

8. Blackwater in Demerara appears prevalently as a disease of children. Out of 56 cases 33 were observed in children below 15 years of age.

9. The tendency of blackwater to recur in the same families has been noted. Five families accounted for 23.2 per cent. of all the cases registered.

10. Though severe and even fulminant cases have been recorded, the majority are mild. Cases showing *P. falciparum* were invariably much more severe.



11. Relapses are frequent, and usually tend to become progressively milder, as tolerance to the chronic infection is gradually acquired.

12. The general mortality among 56 cases was 16 per cent..... The mortality was highest among negroes, who, as a race, were by far the least susceptible to the disease. On the contrary, mortality was lowest for the Bovianders, or mixed races, amongst whom the disease was most prevalent.

13. No fatality was registered in relapsed cases.

14. Stovarsol has been used with very satisfactory results in the treatment of hæmoglobinuria. It has a decided action on the benign tertian parasite, without involving the risk of precipitating a new attack of blackwater.

In Part III of the book malarial albuminuria and nephritis are considered. This is certainly the most interesting section of this valuable work. The cases studied during the seven years numbered 102. The main incidence is not sporadic, but is related to epidemic malaria; it also follows the incidence curve for blackwater fever, but tends to persist over a much longer period. Malaria parasites were found in 61 out of 87 patients with nephritis, or 70 per cent. *Nephritis is almost specifically related to infection with P. malariae*; the figures being an incidence of 20 per cent. in cases of sub-tertian infection, 25 per cent. in benign tertian, and 46 per cent. in quartan malaria. No case of acute nephritis was observed, and red cells were exceptional and when present very scarce in the centrifuged deposit. The prevention of malarial nephritis is the same problem as the prevention of malaria in the same population.

Next follows a valuable short review of the literature on malarial albuminuria and nephritis. It commences with Hippocrates, and ends with Sinton and Lal (1929). The author has here done a real service to malarialogists, for this collated information was very badly wanted. An appendix contains details of 26 cases of malarial nephritis; there is a bibliography of 54 references, and a sufficient index. The book is very well got up and illustrated. One gains at a glance the types of country and houses dealt with.

\* \* \* \* \*

We have devoted considerable space to Dr. Giglioli's book, because we believe it to be a most important contribution to the literature. (The reviewer hopes to have time later to read it more thoroughly and see how the facts therein detailed fit in with his own pet hypothesis—it is nothing more—that blackwater fever is probably due to a filterable virus which is transmitted by the same anopheline species as transmit malaria. The analogy of typhus and relapsing fever may be recalled; both are transmitted in the same area and often among the same population simultaneously by lice; yet they are due to two very different classes of parasites.)

Whatever the solution of the blackwater fever problem, Dr. Giglioli is to be congratulated on a well written, very informative, and useful contribution to the literature.

R. K.

**DISEASE AND THE MAN.**—By George Draper, M.D. London: Kegan Paul, Trench Trubner & Co. Ltd. 1930. Illustrated. Pp. XIX plus 270. Price, 12s. 6d. net.

It is probable that the most successful clinicians have been those who realised the importance of studying the patient as a preliminary to treating the disease. Professor Draper's *Disease and the Man*, is a contribution which attempts to place this study on a scientific basis.

It undertakes to demonstrate that diseases are associated with different types of individuals and that an accurate knowledge of the various types is essential for correct diagnosis.

This, in some degree, has long been recognised, but Dr. Draper would exalt the theories that have arisen from accumulated experience to the plane of scientific

exactitude. In order to do this a great deal of clinical and statistical evidence was necessary and this has been obtained in a clinic specially organised for the purpose.

A new method of investigation was evolved and this method is very interesting.

It is suggested that the complete personality of a man can be divided into four component parts, morphological, physiological, immunological and psychological. These characters can be represented on four separate panels of a screen, and when this screen is completed it will indicate or even demonstrate the disease potentiality of the individual.

Dr. Draper produces a great deal of evidence in support of this theory, but it does seem that some of the arguments are adopted to suit the conclusions that are required. The book is divided into sections that deal with anthropology, genetics, sex, endocrinology, morphology and psychology. It is the correlation of these various sections that is required in order to build up the total personality of the patient.

The book is extremely well written and illustrated. The bibliography and index are complete.

There may be a tendency for the author to exaggerate the importance of the evidence he claims in support of his cause, and it is probable that few will accept all the conclusions.

But the book is very interesting and should be in the hands of all those who desire to understand the methods that have been used and the research that has been carried out in Dr. Draper's clinic.

H. H.

**SYMPTOMS OF VISCERAL DISEASE. A STUDY OF THE VEGETATIVE NERVOUS SYSTEM IN ITS RELATIONSHIP TO CLINICAL MEDICINE.**—By F. M. Pottenger, A.M., M.D., LL.D., F.A.C.P. Fourth edition. St. Louis: The C. V. Mosby Company. 1930. Pp. 426, with 87 text illustrations and 10 colour plates. Price, \$7.50.

THE importance of a knowledge of the functions of the visceral nerves in clinical medicine has long been recognised, but there are very few books that explain this difficult subject, and not many teachers who are capable of marshalling all the facts for the benefit of students and practitioners. Dr. Pottenger's book on the symptoms of visceral disease first appeared in 1919 and now appears enlarged and improved in a fourth edition. The title does not explain or even indicate the subject-matter that is to be found in the pages. The book is not merely a description of the various symptoms that may be found in visceral disease; it goes much deeper than that and discusses the very intricate problems connected with the vegetative nervous system. This includes the anatomy, physiology, and pathology of this system; the pharmacological action of drugs and the biochemical significance of various substances.

The second part of the book deals with the relation of the different organs with the visceral nerves, and shows how this relation is not only a cause of the symptoms, but is often an indication for a rational method of treatment. Perhaps the best section is that on the bronchi and lungs. Dr. Pottenger is a specialist in diseases of the chest and apparently has had a great opportunity of studying the functions of the vegetative nerves in these diseases. This section makes one realise how much more there is to be done in this connection with other systems of the body.

This book is not for the medical student working for his final examination. He already is overburdened with textbooks and must leave the more intricate studies for a post-graduate course. But it is invaluable for the physician or student who wishes to study one of the most important branches of modern medicine. It is very well written and illustrated. The bibliography is excellent and the index complete.

H. H.

**DISEASES OF THE BLOOD.**—By Paul W. Clough, M.D. London: A. & C. Black, Ltd. 1930. Pp. V plus 310. Illustrated. Price, 6s. net.

Diseases of the blood are of particular interest to medical men practising in the tropics. Dr. Clough's monograph should, therefore, appeal to a wide circle of readers who require a somewhat more detailed account than is given in the ordinary textbooks of medicine. The opening chapters are devoted to the origin, morphology and functions of the red and white cells. These cells are fully described and some excellent coloured plates of normal and pathological bloods are provided. Then follows a classification of the anemias, after which the various types are described in detail. The chapter on pernicious anaemia is particularly good. Dr. Clough points out that the significance of the megaloblast in the diagnosis of this condition depends largely on how the term megaloblast is interpreted. There is great tendency to classify as a megaloblast any large red cell with a nucleus that is not pycnotic. Such cells are not uncommon in many other anemias. The term should be restricted, as pointed out by Naegeli, to those cells which have a nucleus about the size of a normal red cell and in which the nucleus shows a well defined fine chromatin network.

Piney's views that pernicious anaemia can only occur in such persons as have a remnant of megaloblastic tissue in their livers receive full consideration. The author holds that while such constitutional defect may predispose to the disease, it does not provide an adequate explanation of many of the manifestations of the disease.

The sickle cell anaemia of the negro is described, also splenic anaemia and Von Jaksch's anaemia. There is a description of acholuric familial jaundice under the heading of hæmolytic jaundice. Next the author deals with the leucemias and the hæmorrhagic diseases. Finally there are excellent chapters on blood transfusion and on the technique of blood examinations. Altogether a useful, clear and concise account of the blood diseases. The volume is a handy pocket size, the print is large and clear, and the binding good.

J. D. S.

**ANGINA PECTORIS.**—By Harlow Brooks, M.D. London: A. & C. Black, Ltd. 1930. Pp. VIII plus 164. Price, 6s. net.

ANGINA pectoris has perhaps been the subject of more investigation than any other cardiac symptom. It was first described by Heberden in 1768. Later Jenner and Parry associated it with disease of the coronary arteries. In our own time Clifford Allbutt, Mackenzie and Danielopollo have advanced explanatory theories. This 'breast pain' has come to signify a clinical entity of deadly significance. Clifford Allbutt sought to explain the pain by inflammatory areas and irritated nerve endings in the aorta. Mackenzie thought it was due to exhaustion of the heart muscle. Danielopollo attributes angina to inadequacy of the coronary circulation causing myocardial exhaustion. He recognises as predisposing factors inflammatory and atheromatous lesions obstructing the mouths and the courses of the vessels, also abnormal vaso-constrictor reflexes and a hyperexcitable condition of the sympathetic and visceral nervous system. Determining factors would be increased work of the heart or deficiency in the blood supply, possibly an anoxæmia of the heart muscle. The pain probably arises in the heart and most likely in the left ventricle. This would explain the tendency towards radiation to the left.

Dr. Harlow Brooks has written a small and eminently readable book on this engrossing subject. The first chapter is historical and pays tribute to the epoch making contributions of Heberden, Jenner and Lauder Brunton. Then follows a general description of the disease and its symptoms. The pathology of the condition is next discussed. The author considers this is varied but is definite enough to subclassify as due to:—

1. Disease or spasm of the coronary arteries.
2. Aortitis.
3. Myocarditis.

Some or all of these may be present. They do not always cause symptoms but they always cause the menace of sudden death.

A chapter is devoted to pseudo-angina and the author discusses the differential diagnosis. English writers strongly discourage the use of this term and like ones, such as angina minor and secondary angina, as they confuse the issue and obscure the essential decision as to whether the patient has angina pectoris or not. Treatment occupies almost half the book. The author looks upon angina as a family disease and strongly stresses the importance of prophylactic treatment in the younger members of such families as are afflicted. Chapters are devoted to specific treatment and the treatment of the attack. Last of all surgical treatment is described. In this connection the work of Spiegel, Cutler and Jonnesco is discussed. The aim of all these is the division of the sensory paths from the heart or aorta. As such paths are very uncertainly known, the procedure can hardly be justified, except in cases of persistent and excessive attacks that have failed to react to any medical treatment. The method of Danielopollo of anaesthetising the dorsal nerve roots corresponding to the area of pain is not mentioned, although some surgeons have had complete success with this less severe operation. The book is an excellent monograph on an important subject and can be strongly recommended to those interested in the subject.

J. D. S.

**LEPROSY: DIAGNOSIS, TREATMENT AND PREVENTION.**—By Dr. E. Muir, M.D., F.R.C.S. (Ed.), 73 Pp. with 25 Illustrations. Fifth Edition. Published by the British Empire Leprosy Relief Association. 1930. Price, As. 8 only.

This useful little handbook will probably be known to most of our readers. It details briefly and succinctly the essential knowledge with regard to leprosy which the general practitioner should possess, and short of a special training in the diagnosis and treatment of the disease, it is the best tuition that the doctor could have in the subject. It also deals briefly with the disease from the public health point of view.

In the present edition recent advances in knowledge have been incorporated. The preparation of hydroncarpus esters by the hot and cold process has been detailed in an appendix, as the author has found that many in charge of leper institutions require this information. The question of predisposing causes and secondary infections is considered more fully than before. The erythrocyte sedimentation test, which is proving so useful in determining the degree of resistance to the disease, is fully described. The lines along which a campaign should be carried on against leprosy are further elaborated in the light of evidence collected from various workers in India.

Whilst the book is written primarily for practitioners in India, its scope should certainly be very much wider. As a medical primer in leprosy, so to speak, it is of value to every medical man in India, whilst the authoritative position of its author emphasises its importance.

**THE PRACTICAL MEDICINE SERIES. SERIES 1929. GENERAL SURGERY.** EDITED.—By E. A. Graham, A.B., M.D., Professor of Surgery, Washington University School of Medicine. Pp. 800 with 183 Illustrations. 1930. Chicago: The Year Book Publishers. Price, \$3.00.

The *Practical Medicine Series* consists of a series of eight volumes published annually, covering the previous year's advances in the entire field of medicine and surgery, each volume being complete on the subject with which it treats for the year prior to its date of publication. The present volume is complete, satisfactory, and presents the advances made in surgery during 1929 in a small compass, well illustrated; it is therefore a volume which every surgeon should possess.

The editor draws attention to some of the most important events in surgery in 1929. One of these is the extensive review by Harvey Cushing of 547 operations conducted in two years on brain tumours removed

by the use of Bovie's electro-surgical unit. This technique has greatly extended the field of brain surgery, whilst the instrument will doubtless be found valuable in other fields of surgery. A second interesting review on the same subject is one by L. E. Davis on the blind spots in intracranial tumour.

A second important observation of the year is one by Barr, Bulger, and Dixon of Washington University on a case of hyper-parathyroidism associated with an adenoma of the parathyroid gland. In this patient there were multiple cystic bone tumours and a negative calcium balance. The removal of the parathyroid tumour was followed by a remarkable improvement in the bone tumours and a restoration of the calcium metabolism to normal.

Keynes of St. Bartholomew's Hospital has reported on a series of 42 cases of primary carcinoma of the breast treated by radium, including 17 inoperable ones. Thirteen of the patients are apparently completely cured, with intervals up to 4 years and no recurrence or metastases; 10 others are improving. B. J. Lee discusses the results in five years at the N. Y. Memorial Hospital; he strongly recommends the use of radium both before and after operation. Sampson Handley stresses the harmful effects of *small* doses of radium in the same condition.

Symmers, from an extensive experience of erysipelas at the Bellevue Hospital, New York, is a strong advocate of Birkhang's serum and claims excellent results from its use, especially in facial cases, 92 per cent. of such cases being cured in 2 to 7 days. The intra-muscular route is the best and the treatment reduces the period of disability by almost 60 per cent.

The literature for 1929 has contained many articles dealing with the question of partial gastrectomy *versus* gastro-jejunostomy in cases of gastric or duodenal ulcer. Dr. Graham notes that some of these articles reveal the ignorance of surgeons of the fundamental physiology involved; "surgery will never become a science until its practitioners are better physiologists than they are at present."

On interesting case reports, Flaum records accidental transmission of malaria during a blood transfusion—always a possibility in practice in the tropics; and A. Meyer of Hamburg the successful removal of an embolus from the pulmonary artery of a young woman.

The volume deals with every branch of surgery, including a 50 page review of recent advances in orthopaedic surgery. It is one which should make an appeal to both surgeons and general practitioners alike.

**THE CLINICAL EXAMINATION OF THE NERVOUS SYSTEM.**—By G. H. Monrad-Krohn, M.D., F.R.C.P. With a foreword by T. G. Stewart, M.D., F.R.C.P. Fifth edition. London: H. K. Lewis and Co., Ltd. 1930. Pp. XVI plus 222 with 57 illustrations. Price, 7s. 6d. net.

A NEW edition of Professor Monrad-Krohn's book appears regularly every second year, and we have no doubt it is received with pleasure by a new generation of medical students on each occasion.

The recognised methods of examining a patient with nervous symptoms have now become crystallised and they provide the most striking examples in logical deduction that we find in modern clinical medicine. But the student does not learn how to do it in the chapters on nervous diseases in the textbooks, and he can scarcely follow the rapid methods of the skilled neurologist at the bed side. This little book will help him to understand the principles that are essential for any neurological examination. It will show him the best way to commence, continue and conclude his examination and he will learn the significance of very many symptoms and signs.

Professor Krohn has spent many years in England and writes in English, so his book does not contain any of the disadvantages that are so often found in a translation. As in previous editions the printing and illustrations leave nothing to be desired and we are sure that at its fifth appearance the popularity of this book will be enhanced.

H. H.

**THE DIAGNOSIS AND TREATMENT OF HEART DISEASE: PRACTICAL POINTS FOR STUDENTS AND PRACTITIONERS.**—By E. M. Brockbank, M.D. (Vict.), F.R.C.P. Sixth Edition. London: H. K. Lewis & Co., Ltd. 1930. Pp. XVI plus 240.

DR. BROCKBANK'S little book on heart disease has now reached a sixth edition and this is evidence of its value to the student. It does not pretend to be a complete treatise on a very large subject, but is rather a simple explanation of the physical signs found in the various disorders of the heart. These physical signs and their significance are frequently a source of difficulty to the student who has not been taught to understand the reason for the abnormalities that he sees and hears. The object of this book is to explain from the beginning how the normal heart works, how its action may become modified and how these modifications lead to irregularities, murmurs, thrills and other signs which the student must locate and understand if he is to make a correct diagnosis.

All this is to be found in the popular books on clinical methods, one of which every student possesses, but the author has been able to deal more fully with the examination of the heart than is possible in a book which includes all the other organs and systems. The section on treatment is short and very simple. The author states in his preface, "I have given the results of many years' experience and refer to simple methods of treatment which have stood the test of time."

It is seldom that we can recommend the student to add to his large number of textbooks, but in this case we have no hesitation in saying that for a small cost he can obtain a book that will help him to understand all that he hears with the stethoscope when he listens to a diseased heart.

H. H.

**VISCEROPTOSIS AND ALLIED ABDOMINAL CONDITIONS ASSOCIATED WITH CHRONIC INVALIDISM.**—By H. Bedingfield, D.S.O., M.D. (Ed.), Ch.B., M.R.C.P. (Lond.). Bombay: Oxford University Press. 1930. Pp. 176. Price, 10s. 6d. net.

THERE is perhaps no symptom-complex in the whole range of medicine in such an unsatisfactory and chaotic position as that described by the generic term of visceroptosis. We doubt if there is a physician bold enough to give a definition of the condition to-day, and the author, wisely, does not attempt to do so. The manifestations are diverse in the extreme and the pathology entirely unsettled. The condition nevertheless is of extreme importance on account of its commonness. The practising physician of any experience rarely completes a day's work without seeing a case. It often leads to chronic invalidism and lifelong misery. Treatment may be restricted to a few kind words or may involve advanced operative surgical measures, including laparotomy and the removal of certain organs, according to the outlook of the physician or surgeon into whose hands the case may have drifted.

Dr. Bedingfield's book does not contain anything very new, but he has collected with amazing industry the essentials of the enormous literature that has grown up around the subject. The bibliography at the end of the book runs to no less than 20 pages and includes 641 references. The book indeed, is more an epitome of the literature on the subject than a new compilation. Dr. Bedingfield's own conclusions and recommendations are given in the final chapter on treatment. He considers the association of *malnutrition, poor muscle tone and abnormal mental reactivity* to be characteristic of the condition. He considers there is a congenital and perhaps an hereditary inability of the sufferer to adapt himself to the stress of life. He entirely discounts the theory of a toxemia on account of the absence of any evidence of a toxin and he considers that the treatment should be essentially preventive. As regards surgical intervention, he looks upon it as a useless method of treatment and a criminal method of diagnosis. Strong words, but how true!

We consider the book a most valuable addition to a subject requiring much illumination. We would recommend every practising physician to get a copy and to read the evidence for the conclusions given. With the latter we are in complete agreement. The Oxford University Press are responsible for this attractively printed and bound volume.

J. D. S.

**THE MYCOSES OF THE SPLEEN.**—By Alexander George Gibson, M.D., F.R.C.P. London: Kegan Paul, Trench, Trubner and Co., Ltd., 1930. Pp. XII plus 169 with 17 figures. Price, 12s. 6d. net.

This book is an attempt to prove that there are certain conditions of enlarged spleen due to mycotic fungi. The evidence put forward by the writer is extremely weak, although he states that he has cultivated a *Nocardia* fungus which he has named *Nocardia splenica*. In support of his views, he quotes Professor Nanta's work on the same subject, but it is certain that Nanta's cases were due to an *Aspergillus* fungus.

A considerable portion of the book is devoted to the interpretation of the Gandy-Gamma nodule which looks more like a fibrous nodule, but is interpreted as being a fungus. Our experience of these fungi shows that it is very difficult to stain them properly with hamatoxylin. There is no doubt however that there is a condition of splenomegaly due to mycotic fungus.

Recently we have found that a *Streptothrix* infection can occur in the gut on top of old dysenteric ulcers, etc., and most probably this forms a source from which these fungi are carried to the spleen. Dr. Gibson endeavours to show that Banti's disease and acholuric jaundice are due to this *Nocardia* fungus, but in our opinion he has not proved his case. There are better methods used for growing and studying these fungi than those which the author has employed in his study. The length of time taken for some of the fungi to grow suggests the possibility of contamination by growth through the cotton-wool plugs.

H. W. A.

**DIABETES MELLITUS AND ITS DIETETIC TREATMENT.**—By B. D. Basu, Major I.M.S. (retired); Edited by Lalit Mohon Basu, M.B. (Cal.), Allahabad, 1930. Fifteenth Edition. Pp. 160. Price, Rs. 2.

WHEN reviewing this book about four years ago we suggested that the book would be useful if it was more up-to-date and in line with the recent marvellous developments in the diagnosis and the treatment of the disease. Though the size of the book has been considerably enlarged, we are sorry to find that no material additions and alterations have been made in the book with reference to the newer knowledge of the disease, and the author continues to describe factors about the ætiology, pathology and the treatment of diabetes which were obsolete then and are antiquated by now and which should not find a place in any modern treatise on diabetes except as matters of historical knowledge.

We are glad, however, to welcome the addition of a new chapter in the book on insulin therapy consisting of 33 pages and contributed by the editor which embodies more or less the recent knowledge on the subject.

The book contains a few inaccurate and at places contradictory statements which we hope will be corrected in the future edition of the book. Its usefulness, it appears to us, would be considerably enhanced if a more practical editor would put his pruning knife to many of the fanciful and whimsical ideas and statements scattered somewhat at random in the book.

J. P. B.

**TREATMENT IN GENERAL PRACTICE.**—By Harry Beckman, M.D. Philadelphia & London: W. B. Saunders Company, 1930. Pp. 899. Price, 45s. net.

THE author of this work states in his preface that the object of his book is to refute certain false beliefs commonly held by the young practitioner of to-day.

The chief of these are that certain therapeutic principles invariably hold and need only be varied in detail in the handling of particular diseases, and that the art of treatment is one that "comes" once the art of diagnosis has been mastered. He considers that the teaching of therapeutics is neglected, being generally given as an inadequate course of lectures delivered to junior students. That there is much truth and force in his contention, few will deny. In the present work the particular therapy of each disease is described in detail as it has been evolved out of the experience of physicians all over the world. The true authors of the book are therefore those whose names appear in the bibliography. The latter occupies 32 large pages and includes numerous names famous in medicine. To criticise a book of this kind would be to criticise many masters in medicine. It is crammed full of condensed information and forms a most valuable therapeutic guide for those who wish to have the latest authoritative methods of treatment (very often given in the authorities' own words) at their disposal. Some of the sections are remarkably complete and contain a wealth of detail not found, as far as we are aware, in any other work of the sort.

The section on diabetes mellitus is a case in point, and it would be well if every practitioner in India who has to deal with diabetes (and few have not) would read, mark and learn it. It contains a wealth of practical information and approaches the problem of diabetes from every point. Joslin's type of treatment (moderate undernutrition and small amounts of insulin) receives a large share of consideration. This authority is quoted verbatim *in extenso*, and the reading is as instructive as it is fascinating. The Sansum type of treatment (full nutrition and large amounts of insulin) and the Petren, Newburgh and Marsh type (high fat, low protein and carbohydrate) are then considered and contrasted. A full account of Synthalin and a summary of its results are given.

In the section on malaria, pride of therapeutic place is naturally given to quinine, the specific remedy par excellence. The treatment of the different varieties of the disease is fully described. The views of American authors are almost exclusively given, particularly those of Fernan-Nunez. This author stresses the use of the arspenamines in malaria and especially in its early treatment. He maintains that this drug immediately cuts short the fever in all types of the disease and by doing so very materially shortens the disease and hastens recovery. For tertian malaria he holds that Neoarsphenamine alone is specific.

The section on syphilis occupies 58 pages. It begins with a critical review of the differences in the English and American methods of dealing with early infection. The essential difference is that the former adopts the method of massive doses given over short periods, while the latter gives small doses over prolonged periods. Thus the average dose (in the abortive method of treatment) given in England is 0.5 or 0.6 gm., whereas the average dose in America would be 0.4 or 0.3 gm. The author selects for consideration in detail the method employed in the Johns Hopkins Hospital, Baltimore. The standard of length of treatment was one year's continuous treatment after blood and spinal fluid Wassermann reactions had become and remained completely negative. The criteria of cure involve a whole year's probation during which no treatment is given and frequent Wassermann tests made. At the end of that time a complete examination of the patient is made, including a detailed examination of the nervous and cardio-vascular systems. The cerebrospinal fluid is then again examined. When the patient has successfully passed these tests, it is explained to him that his cure is probable but not certain and that the price of continued good health is eternal vigilance. He is urged to have periodic physical and serological examinations for the rest of his life. What a difference in outlook is there here from that usually adopted!

The section of tuberculosis contains no description of artificial pneumothorax. This, we think, is a pity, as

the measure is one of the few methods of instituting active treatment in lung tubercle, and its troublesome complication, hæmoptysis.

The section on diseases of the kidneys is disappointing and consists of only about seven pages.

Included in the book are short sections on obstetrics and on burns, for the use of the general practitioner.

The labour involved in producing the book must have been immense. The author has brought it to a most successful issue. It can be strongly recommended to all practising physicians and particularly to those engaged in consulting practice. The book is published by W. B. Saunders Company. The binding and letterpress are above reproach.

J. D. S.

#### **INJECTIO-THERAPY IN GENERAL PRACTICE.**

—By P. K. Kurup, L.C.P. & S. (Bombay). Pp. 160. Malabar, 1929, The Sreekrishna Vilasam Press, Tallparamba. Price, Rs. 2.

THIS little book may perhaps be found useful by general practitioners. It summarizes in concise fashion the different methods of hypodermic, intramuscular, and intravenous injections; and deals with infusion, proctolysis, anaphylaxis, air embolism, and intraspinal injections. Over 100 pages are devoted to an alphabetical list of extra-pharmacopœial injections, the main uses and indications for each of which are given. The second part of the book is devoted to the use of vaccines and sera in treatment, with again a list of the chief vaccines and sera in use and indications for their employment. A table of hypodermic posology is also given. The book is dedicated to the late Dr. T. M. Nair, whose career as a medical practitioner, author and journalist, and as a legislator is described.

#### **BAILLIERE'S SYNTHETIC ANATOMY.—By J. E. Cheesman. Part IV. The Thigh and Hip. With 12 plates. Price, 3s.**

WE have previously reviewed other parts of this most valuable publication, for which we have nothing but praise. The present section consists of 12 coloured transparent plates, printed in six colours, and provided with a key index. The idea underlying the use of this *Synthetic Anatomy* is extremely ingenious; the whole of the anatomical relationships of the part can be reconstructed by superimposing two or more of the transparencies over one another, with the centimetre key index below. In brief, the student can almost re-dissect the part from a study of the transparent plates, layer by layer.

Baillière's *Synthetic Anatomy* should make a special appeal to medical students, whilst it should also prove useful to surgeons who wish to revise their anatomy. At present eight parts have been issued in all, and five more are in preparation. The complete set will provide the student with a most useful synopsis of the dissection of the entire body.

#### **DEMONSTRATIONS OF PHYSICAL SIGNS IN CLINICAL SURGERY.—By Hamilton Bailey, F.R.C.S. Second Edition. Revised and Enlarged. Bristol: John Wright and Sons Ltd. 1930. Pp. XVIII plus 268 with 306 figures in the text. Price, 21s. net.**

IT is a pleasure to welcome a second edition, revised and enlarged, of this excellent book. In reviewing the first edition we remarked that the author was out to combat the prevailing tendency to regard diagnosis as an affair for the laboratory and to emphasise, as Lejars does in his more ambitious work, that physical examination must always remain the main channel of diagnostic information and that too much stress cannot be laid on this aspect of the students' training. A book such as this should prove very helpful. Since the last edition it has grown by 50 pages and 45 illustrations. All of the new sections and illustrations are useful, and we would select for special commendation the series of instructive photographs of inflammatory and ulcerative conditions shown in Figures 21—27. Other good additions are the pictures showing Volkmann's contracture, the method of palpating for

fracture of the rib, testing the movements of the shoulder joint and palpation of the kidney. Figure 205 showing the areas of tenderness in Salpingitis and Figure 237 of a Charcot's disease of the knee joint are both excellent, as are the new sections on diagnosis of retro-mammary abscess, ectopic gestation, acute dilatation of the stomach, pneumococcal peritonitis, suppuration in the deep iliac glands (a condition commonly met with in this part of India) and torsion of the testis. The section on examination of the prostate is incomplete, in that no mention is made of the inflammatory nodules so commonly met with in chronic prostatitis, though instructions are given for the expression of prostatic secretion and its microscopic examination in cases of suspected chronic gonorrhœa.

We expect to see this book grow in size with each succeeding edition; it fills a gap in English surgical literature and we can confidently recommend it both to students and teachers.

W. L. H.

#### **THE SCIENCE AND PRACTICE OF SURGERY.—**

By W. H. C. Romanis, M.A., M.B., M.Ch. (Cantab.), F.R.C.S. (Eng.), F.R.S. (Edin.), and P. H. Mitchener, M.D., M.S. (Lond.), F.R.C.S. (Eng.), Second Edition. 1929. 2 Vols. London: J. & A. Churchill. 1929. Vols. I & II. Over 1,800 pages with numerous illustrations. Price, 14s. each volume.

WITHIN a year of the original publication of *The Science and Practice of Surgery* by Romanis and Mitchener a second edition has been called for. This fact in itself may be taken as a useful criterion of the popularity of the work. The authors are to be congratulated on having produced a most readable book, written in a phraseology both lucid and attractive. The subject matter is of a standard suitable to candidates for the higher examinations in surgery, and yet it can be readily understood and appreciated by students entering for their qualifying examinations.

The work is published in two volumes, the first of which consists of general surgery, and the second regional surgery. In all there are some 1,695 closely printed pages.

Volume I contains a very full description of surgical pathological conditions. Adequate attention is given to the pathology, clinical aspects and the treatment of these conditions. The first three chapters are devoted to bacteriology and allied subjects. Chapter XXII contains a description of x-rays and radium. The section on radium is very brief. The last chapter is concerned with anæsthetics, surely a very useful addition to a textbook in surgery. The short section in Chapter IV dealing with shock and collapse appears to be inadequate. The only theory regarding the pathology of collapse which is described is the chemical one of Dale and Laidlaw. No mention is made of other interesting theories concerning the condition. The technique of blood transfusion is very briefly dealt with. Nothing is said concerning the tannic acid treatment of burns.

In Volume II, which is devoted to regional surgery, is given at the beginning of each chapter a clear description of the surgical anatomy of the particular organ to be dealt with. Sufficient is given in the special sections on ophthalmology and oto-rhino-laryngology to be most useful to the student of general surgery. In the chapter on diseases of the kidney only a very brief description is given of pyelography, and no account whatsoever of the method of reading pyelograms.

For a textbook in general surgery a very adequate space is allotted to operative surgery and this feature considerably enhances the value of the book. Certain operations are described which have now become obsolete, reasons being given for their gradual disappearance from surgical practice. After-treatment of operation cases is very well dealt with throughout the book.

Both volumes are beautifully illustrated. The printing is good and the paper excellent.

A. H. P.



**THE DRAMATIC IN SURGERY.**—By G. Gordon-Taylor, O.B.E., M.A., F.R.C.S. Bristol: John Wright and Sons Ltd. 1930. Pp. 88 with 40 illustrations in the text, 11 of which are fully coloured. Price, 12s. 6d. net.

This small book of 88 pages is compiled from an address given to the Surgical Society of Manchester in February, 1928. There can be few surgeons who have not met with the dramatic in surgery; all will read this book with a thrill, and many would wish to be permitted to add some of their own experiences. In India, much more than in perhaps any other country, the keen surgeon comes into abrupt contact with the romantic, the dramatic, and the tragic—the scrotal tumour which may have to be conveyed in front of the embarrassed owner in a wheel-barrow; the erring wife who comes noseless to the surgeon for some operation which will restore her respectability; the mangled heap of flesh, the product of an encounter with a tiger or wild boar, brought to the surgeon by a hunting party out for a happy day.

The author gives us examples of dramatic and spectacular surgery, and of brilliant and exquisite technique. Many of these are collected from war records and recollections, and all of them are of the greatest interest. It is good for the young surgeon to fully realize some of the marvels of modern surgery; such supreme efforts as the successful removal of a pulmonary embolus, even in an individual who presents almost every evidence of suspended animation.

The small volume is handsomely produced, and the coloured and other illustrations leave nothing to be improved upon. It will adorn the bookshelf of every keen surgeon.

F. P. C.

**DIABETIC SURGERY.**—By Leland S. McKiltrick, M.D., F.A.C.S., and Howard F. Root, M.D. With a foreword by Daniel F. Jones, M.D., and Elliot P. Joslin, M.D. London: Baillière, Tindall and Cox. 1929. Pp. IX plus 269. Illustrated with 79 engravings and 2 coloured plates. Price, 21s. net.

INSULIN has undoubtedly placed a large number of diabetics in the surgeon's hands, by making it possible to operate when necessary without incurring unreasonable risk. The importance of this will be realised when it is considered that at least 25 per cent. of diabetics become surgical problems. The authors attempt to review in this book the first five years of the "Banting era," as regards surgical diabetics treated at the New England Deaconess Hospital. It is stated in their preface that it is their "desire to paint a composite picture of the conditions found in a large series of cases and to describe the methods of medical and surgical treatment used, laying emphasis upon the most frequent and characteristic lesions and upon those procedures which experience has proved to be of diagnostic and therapeutic value."

The book is of peculiar interest in India where diabetes is so common, and particularly so in hot and very moist parts like Bengal where surgical complications are more likely to occur. There are twelve chapters dealing with the incidence and importance of diabetic surgery; the diabetic as a surgical risk; medical problems; anaesthesia; lesions of the lower extremities; of the upper extremities; of the skin and subcutaneous tissues; abdominal surgery in diabetics; hyperthyroidism in diabetes; malignant disease; miscellaneous surgical conditions; technical methods.

The authors deal with each of these sections in a thoroughly practical manner, basing their observations on the results recorded in the New England Deaconess Hospital. Their work will be very much appreciated by the large body of medical practitioners, who have no opportunity of studying the subject scientifically under strict hospital conditions.

F. P. C.

**ARTHRITIS AND RHEUMATOID CONDITIONS.**—By R. Pemberton, M.S., M.D. London: Baillière, Tindall and Cox. 1929. Pp. XII plus 354, with 42 text figures. Price, 25s. net.

This work is the product of fifteen years of clinical and laboratory observations on the problem of arthritis and the rheumatoid syndrome.

In his preface, the author stresses the importance of a broad physiological concept of the disease and the necessity for "wide angled" vision in dealing with the problems which its protein forms present.

The first third of the volume deals with the pathological background from which the disease springs, and includes discussions on the rôle of infection, especially that of focal sepsis; the nature of the influence of bacteria in arthritis; the influence of heredity and constitution, and clinical data bearing on the aetiology. The latter two-thirds is intended as a practical exposition of principles and methods of treatment.

The work is well conceived and brilliantly executed. It comprises many new data, ideas, and facts, e.g., Haden's work on selective localisation in animals when infected with bacteria from chronic foci, and Zinsser's work on acute rheumatic fever, with special reference to the allergic state. "It is thus conceivable," writes the author, "that when the body has long harboured a definite infection it may become allergic to bacterial substances given off from the growing bacteria." Hence the fact that in acute articular rheumatism the joint fluids are usually sterile.

In connection with the clinical study of 1,100 cases of chronic arthritis, comparisons are made between 400 cases among soldiers, representing a different age group and 700 civilians, and some useful conclusions drawn.

Under the heading dynamic pathology, various factors are discussed, such as the basal metabolism, blood nitrogen, uric acid,  $\text{CO}_2$  combining power of the blood, the blood calcium, etc. Everywhere the desire for completeness is evident.

Perhaps the most significant discovery herein described is the fact that ligation of the patellar vessels in the dog brings about changes suggestive of the hypertrophic or degenerative form of the disease.

Finally, treatment is fully discussed under the headings general treatment, treatment of focal infections, rôle of the intestines, colonic irrigation, influence of anaebiasis, vaccine therapy, physiotherapy, diet, drugs, and medicinal measures.

There is a special chapter on arthritis in childhood, gonorrhoeal arthritis, and acute rheumatic fever.

On the whole this book, as becomes its distinguished author, is written in a simple, lucid style, and bears evidence of the pen of one who has complete understanding of his subject. The publishers, too, are to be congratulated on the general get-up of the volume and the excellence of the illustrations.

J. A. S.

**MINOR SURGERY.**—By F. Christopher, M.D., F.A.C.S. with a foreword by A. B. Kanavel, M.D., F.A.C.S. London: W. B. Saunders Company Ltd. 1929. Pp. 694 with 465 illustrations. Price, 36s. net.

In his foreword Dr. Allen B. Kanavel, whose work on infections of the hand has won world wide renown, points out that the more intensive instruction of the student in the basic sciences, the more elaborate study of the various major diseases and more complicated methods of treatment have tended to crowd the curriculum so much that little time can be given to the less serious ailments and injuries which form a large part of the young doctor's practice. The need for a textbook devoted to these aspects of surgery is further emphasised by the great increase of accidents associated with industrial developments or due to motor traffic which come under the care of the practitioner nearest the scene of the accident, regardless of his surgical experience. The subsequent course of the injury is in a large measure determined by the emergency treatment rendered and incompetence may easily convert minor into major surgery.



This book is designed to meet the needs of the hospital interne as well as those of the general practitioner and it is doubtless for this reason that many subjects are dealt with which can hardly be considered "minor," the treatment of gas gangrene for instance, curetting of the uterus in cases of incomplete abortion, and the treatment of adenomata and cysts of the breasts, to which latter subject a long section is devoted, dealing mainly with the diagnosis between innocent and malignant conditions. The book is remarkably complete, almost everything is mentioned, sometimes with a wealth of references which is confusing, thus in the section on the treatment of varicose veins by injection no fewer than eight authorities each with a different method are quoted. More didactic teaching is more helpful to junior practitioners. After a few preliminary chapters on wounds, septic processes and injuries in general, the subject is dealt with by regions of the body, a method which facilitates reference. Sections which may be singled out for commendation are those on the treatment of fracture of the clavicle illustrated by a number of excellent figures, that on the treatment of empyema by the closed method, and those on the treatment of infections of the hand and fingers. It is surprising to find no mention of caudal and sacral anaesthesia, of the injection treatment of haemorrhoids or of the use of diathermy in epididymitis. The book is well printed, the illustrations are good, and there is a very complete index. It should be very useful to house surgeons and junior practitioners.

W. L. H.

**IMMUNITY IN INFECTIOUS DISEASES.**—By A. Besredka. Authorised translation by Herbert Child. London: Baillière, Tindall and Cox. 1930. Pp. VII plus 364. Price, 18s. net.

In this book Professor Besredka has collected fifteen essays previously published in various journals. The articles have lost some of their freshness through the lapse of years (the earliest is dated 1898 and the last in 1927). Each chapter gives one the views held up to the time of its first publication. Full justice is done to the evidence produced by other investigators in so far as it has a bearing on the author's own theme and a short bibliography, chiefly from continental workers, is appended to each chapter. The book is essentially an orderly presentation and discussion on the investigations carried out by the author at the Pasteur Institute, Paris, during the past thirty years. The science of immunology is still far from perfect and as the author says in the preface, "a didactic work in the shape of a treatise on immunity would run the risk of being slightly out of date as soon as it left the printing press." In that case it seems hardly prudent to republish such articles as that on the bactericidal power of leucocytes, the bacterial haemolysis, the problem of the unity and diversity of the streptococci, antistreptococcal serotherapy and microbial endotoxin, all written more than fifteen years ago, without incorporating into them the recent advances and without any reference to recent literature. They have their historic interest, and illustrate how the science of immunity was built up. Then follow chapters on sensitised vaccines and vaccination in general, followed by studies on antiviral immunisation. A mass of evidence, laboratory and statistical, is given to show the superiority of sensitised vaccines over ordinary vaccines. Immunity after the use of sensitised vaccines appears very quickly and sensitised vaccines produce much less local and general reaction; the immunity is more lasting than that obtained by other modes of vaccination. Antibodies do not develop after the use of sensitised vaccines. Professor Besredka and his co-workers have shown that acquisition of immunity without the development of antibodies can take place. Oral vaccination, with or without the mordant action of bile, in intestinal diseases is discussed. By the use of ox bile, which by denuding the intestinal mucosa allows the vaccines to come in contact with the receptive cells which are thereby desensitised, immunity results. Though immunity

might be maintained by means of vaccines, estimates of the amount of this immunity are probably too optimistic and require further investigation. In speaking of the practical application of vaccines the author says that in English speaking countries the use of vaccines is especially widespread. "They treat by needle puncture almost all the infections from the trivial coryza to the most serious septicæmia. In France, people are less lavish with hypodermic injections." It has to be admitted that this is true in many cases, particularly in India does the clinician rush to the needle.

The rest of the book is taken up with a discussion on antiviral immunisation. Old bacterial cultures filtered through a porcelain candle and the filtrates applied locally in shape of dressings, or infiltration into cavities, etc., have been used with marked success in cases of boils, carbuncles, whitlow, osteitis, osteomyelitis, pleurisy, peritonitis, puerperal fevers and other infectious diseases. The author's own cases and cases treated by various doctors are fully detailed. In discussing the mode of action of antiviruses the author states that by reason of their affinity, which is that of the cocci themselves from which they are derived, they are absorbed by the receptive or sensitive cells, and these cells impregnated with antiviral find their natural immunity increased, so that when an infection occurs the cells react as if they were in contact with saprophytic organisms. Besides this, the principal action, the antiviral exerts a paralysing effect on the growth of the culture in the heart of the infected focus. Perhaps it is this second rôle that plays the principal part in immunity. It is suggested that a strain of bacteriophage present in the filtrate causes this paralysing effect on the bacteria, and the secretion of lysins renders the receptive cells capable of destroying the bacteria by phagocytosis. The immunity results from the body reaction to the split-products of bacteria under the influence of bacteriophage.

It is to be regretted that in a book on immunity d'Herelle's work on the rôle of bacteriophage is entirely ignored.

The translation is good and the general get-up of the book excellent. This is a concise and clear exposition of the views of Besredka and his co-workers and the book will appeal to all students of immunity.

C. L. P.

## Annual Reports.

**THE XXIII REPORT OF THE MEDICAL OFFICER OF HEALTH OF THE MUNICIPALITY OF COLOMBO FOR THE YEAR 1928. PRINTED AT THE MUNICIPAL PRINTING OFFICE, COLOMBO, CEYLON.**

This is a very well produced and interesting report of commendable brevity and clarity. Colombo owns a well-constituted health service and the subsidiary services are particularly efficient, the work of Dr. Hirst, the City Microbiologist, being of a very high and outstanding quality.

The records of the monthly temperatures are interesting, as the variation of the monthly temperatures is not more than about two degrees and half F. The average temperature is between 78.6° and 82°F. all the year round. Similarly the relative humidity is always high and ranges from 77% in January to 82% in June.

The estimated population is about 265,000 but this is thought to be too low. The birth rate for 1928 on the estimated population was 35.8 per 1,000, the death rate 30.2, and the infant mortality rate 181 per 1,000 births. Pneumonia is the chief cause of death—4.47 per 1,000; phthisis caused 2.26 deaths per 1,000; diarrhoea and enteritis 2.16 per 1,000; enteric fever 0.53 per 1,000; and plague 0.14 per 1,000.

A very complete analysis is given of the deaths amongst the numerous classes of inhabitants comprising the population of Ceylon. The infant mortality rate has evidently caused concern and a new War Memorial Child Welfare Centre has been opened and a trained staff is now engaged in this uphill work. There has been a noteworthy lowering of infantile mortality rate from 271 in 1919 to 181 in 1928. The large coolie population of Tamils gives the highest rates. Of the infectious diseases plague showed a diminution. Only 10 deaths occurred from small-pox, and epidemics of small-pox in Colombo, like plague, are ascribed to importation from India. There were 528 cases of typhoid fever during the year and an interesting spot map shows the distribution in crowded areas. Phthisis as in other tropical cities gives concern and practical measures are difficult. Public markets have generally improved of late years as is evidenced by the excellent photographs of municipal markets. The problem of giving a plentiful supply of pure milk at a reasonable cost has not yet been solved. A novel idea is the Colombo Ladies' League which every year gives prizes for the best bakeries in the town. The scavenging and conservancy are undoubtedly well done, for the report states that visitors and tourists constantly make eulogistic remarks on the cleanliness of the town. Calcutta might take a hint in this matter. A real effort is being made to improve the housing conditions of the lower classes, and the Municipality has voted Rs. 1,00,000 in order to house its labour decently.

The report of Dr. Fabian Hirst, City Microbiologist, is of very special interest. Dr. Hirst has established a wide reputation as a very thorough scientific worker and anything he writes is worthy of special reading. The feature of this report is the very complete critical account of the biology of the Colombo water supply. This is a very excellent discussion of the whole question of biological problems in tropical water supplies and everyone interested in the subject should read the report in its entirety. The Colombo water supply is from an upland surface-impounded lake; the purity of the water varies in different seasons and conditions and presents special problems to the biologist and engineer. The presence of iron and iron bacteria was long a difficulty and Dr. Hirst suggested the solution of this problem by treatment with lime and submerged treatment by coke by jet sprays and filtration. These processes get rid of the iron and the iron bacteria. There is an extremely able discussion on the whole question of bacteriological examinations and standards of potable water and their interpretation. Dr. Hirst favours the original methods of MacConkey of carbohydrate fermentation as affording the most rapid and helpful information. He has some interesting observations on the significance of *B. cloacæ* in unfiltered and filtered waters. He regards it as evidence of self-purification. He also records interesting work on the use of *B. lactis aerogenes* as a test-organism for filtration efficiency. There is also a very good discussion on incrustations in pipes. Dr. Hirst's views on the *cheopis-astia* question are well-known, as he originated this aspect of the spread and incidence of plague. In this report he records several flea surveys in Kandy where plague had broken out. The prevalent fleas were *X. cheopis*, the only rats showing *X. astia* to the exclusion of *cheopis* being found at the periphery of the newly infected areas. Dr. Hirst is convinced that epizootic plague was introduced into Ceylon by infected *X. cheopis* and that its continued prevalence is due to the ability of the *X. cheopis* to form strong local colonies in the island, and that plague is disseminated in Ceylon by infected *cheopis* with the carriage of grain. These opinions are strengthened by the records quoted. Dr. Hirst has always said that his arguments in this connection need not and cannot be applied to the plains of Northern India where climatic conditions vary greatly and where plague is epidemic. He also emphasises his previous statement that laboratory experiments in the transmission of plague cannot be applied to conditions in Nature, just as similar experi-

ments in the transmission of malaria in the laboratory do not coincide with actual experiences in natural conditions. An interesting experiment in making granaries "rat-free" is mentioned—this consisted in smoothing the partition walls with cement so that the rats could not get access from one part of the granary to another.

The whole health report is well worth reading and is a good example of combined scientific investigation and administration.

QUARTERLY REPORT OF THE MYSORE DEPARTMENT OF HEALTH. VOL. I. NO. 3. JULY 1ST TO SEPTEMBER 30TH, 1929. VOL. I. NO. 4. OCTOBER 1ST TO DECEMBER 31ST, 1929. BANGALORE. PRINTED AT THE MYSORE GOVERNMENT PRESS, 1930.

The Public Health activities of the Mysore State have been recently revised. The services of Dr. Sweet have been lent to the State by the International Health Division of the Rockefeller Foundation and Dr. Sweet's advice has been available for the re-organisation. His proposals have been lately accepted by the Mysore Government. His main proposals were:—

(1) The separation of the Sanitary Department from the Medical

(2) The division of the Department of Health into Bureaux dealing with different aspects of Public Health activity.

(3) The establishment of local units under competent Health Officers in Taluks and Municipalities and the appointment of District Health Officers; and

(4) The continuance of the Health Officers as at present for certain of the larger Municipalities and special areas such as the Kolar Gold Field.

A whole-time Sanitary Commissioner has now been appointed, and a Central Health Committee formed which assist the Government in all important health matters. The following bureaux have been established and have been given nucleus personnel.

- (1) Bureau of Administration.
- (2) Bureau of Epidemiology and Communicable Diseases.
- (3) Bureau of Laboratories.
- (4) Bureau of Vital Statistics.
- (5) Bureau of Health Education.
- (6) Bureau of Sanitary Engineering, and
- (7) Bureau of Rural Health.

The work already in progress in being continued, but re-arranged under the various bureaux. The work of the Bureau of Public Health should prove very useful—it carries out home surveys, conducts vaccinations, has a visiting staff for child welfare and maternity work and holds clinics in small towns and at unit villages. It is developing the "bore hole" system of latrine which has proved useful in the Philippines and over a large area of Madras. In Mysore City, typhoid fever appears to be a problem and the Director of Public Health thinks it should be made a notifiable disease. Plague is endemic in some areas, but the State during the term under review was free from cholera. The re-organised Health Department should be a very useful and helpful addition to the State's activities.

FOURTEENTH ANNUAL REPORT OF THE BRITISH SOCIAL HYGIENE COUNCIL (INCORPORATED). FORMERLY THE NATIONAL COUNCIL FOR COMBATING VENEREAL DISEASES (INCORPORATED, JUNE 1ST, 1928 TO 31ST, 1929.) LONDON: THE BRITISH SOCIAL HYGIENE COUNCIL (INCORPORATED).

This Report of the British Social Hygiene Council comes at a very important juncture in the Council's history. As the National Council for combating venereal diseases, it took a very prominent part in making the prevention and especially the treatment of venereal disease a matter of national and State concern. On the issue of the regulations for treatment

of venereal disease in 1916, local authorities were compelled to submit schemes for the treatment of venereal disease. The work of education and propaganda was entrusted to the Council which was given a grant from central revenues which together with subscriptions from the public enabled it to carry on its work. It has always worked in close co-operation with local bodies and given every assistance to them in the way of sending lecturers, films and literatures. Under the Local Self-Government Act of 1929, the entire responsibility for all actions in regard to venereal disease is placed on local authorities, so that it seems probable that no grant from central revenues will be given to the Council. It is possible however that grants may be made by local authorities to the Council to continue educational and propaganda work. There appears to be considerable danger of the Council's activities being curtailed, but the present Minister of Health is distinctly sympathetic and appreciative of the Council's work and accomplishments. The Council prepares annually a careful summary of the work carried out at the treatment centres and the following is taken from their report:—

The practical outcome of the combined efforts of the Government, Local Authorities, and the Council since the issue of regulations by the Local Government Board in 1916 amounted, in England and Wales alone, at the end of the period dealt with, to 188 treatment centres, including 59 directly controlled by the Council, 14 hostels for infected girls, 8 institutions for the care of infected pregnant women, the enlistment of maternity and child welfare centres in the work, and 77 approved laboratories for the examination of specimens.

Statistical returns from the treatment centres show that, under the combined influence of propaganda, suitable premises, and a sympathetic and tactful staff, the number of persons applying for treatment has increased enormously (from 1,488,514 in 1920 to 2,422,749 in 1928), and what is most significant, that a large and fairly constant proportion (between 1 and 2 per cent.) of these are returned as non-venereal. It is very gratifying to note that the incidence of syphilis is falling, and this is indicated not only by the figures just referred to but also, and this is most important, by certain statistical considerations connected with the general population. For instance, the number of deaths certified as due to infantile syphilis has fallen very considerably, and so have the returns of blindness from the same cause. The incidence of the disease in the Army, Navy and Air Forces, a very accurate and as it happens a carefully controlled index of the prevalence of disease in the civil population, has also fallen unmistakably.

These are indeed great achievements, attained it is true by the enlightened initiative and generous support of Government and the sympathetic co-operation of Local Authorities, but the part played by the Council was not a small one. Dominated by the idea that the only sure means of combating an evil that is due to social conditions related to sex is to engender in the individual a sense of responsibility to himself or herself and to the community, and a proper appreciation of the position of sex in the equipment of the race, it set out to educate adolescents and adults alike.

We note that there are branches of the Council in Bombay, Bengal, Burma, Madras and Mysore in India, but Madras and Bombay are the only branches mentioned which have been active.

We trust that the Council will be able to continue its activities. It has undoubtedly been a great instrument in moulding public opinion in the necessity for public and State action in these serious diseases.

#### THE INSTITUTE FOR MEDICAL RESEARCH, KUALA LUMPUR, FEDERATED MALAY STATES. ANNUAL REPORT FOR 1928.

THIS report, by Dr. G. V. Allen, the Acting Director, is of very great interest and is an important contribution to the literature on medical research work in tropical medicine. The Institute, with its bacterio-

logical, chemical, entomological, pathological, malaria research, and serological sections and divisions has a very strong staff, and each year sees its importance growing.

The chief administrative change during the year was that the Malaria Bureau was evacuated from Bukit Nanas and transferred to the Institute, where it was re-arranged to form two new divisions, one dealing with the entomological, the other with the parasitological, aspects of malaria. The work of the chemical department was also re-organised, a new chemical laboratory being opened in the Trade and Customs Department to take much of the routine analysis off the hands of the Institute, and leave its chemical department free for research work.

Of the many recent contributions from the Kuala Lumpur Institute to tropical medicine, perhaps that on tropical typhus by Dr. Fletcher, recently Director of the Institute, is perhaps the best known. Work on this disease was continued during 1928. The disease shows very marked differences from epidemic louse-borne typhus: one attack confers complete immunity; the mortality is very low—6 deaths in 85 cases observed; whilst the blood of 84 cases agglutinated with the "K" strain of *Proteus* X 19, but only one with the "W" strain. The disease occurs during all months of the year, and 78 out of 85 cases occurred among coolies who were working either on oil palms or in very close proximity to these trees. Three other patients had also been in fairly close contact with oil palms. Cattle appear to play no part in disseminating the disease, and either the palm trees or the ground immediately beneath and around them appear to harbour the vector of the disease.

Guinea-pigs can be experimentally infected with the virus from the patient's blood, but only with some difficulty; rats show a febrile reaction to the virus, but not much else—though there may be hæmorrhages in the lungs. Agglutination occurs with the "K" (Kingsbury) strain of *Proteus* X 19, but not with the European strains which give an agglutination in true cases of louse-borne epidemic typhus. Agglutination is best seen with broth cultures, living cultures give better results than dead ones, the optimum temperature for agglutination is 37°C.—two hours on the water bath, and Dreyer's technique is preferred.

In the Malaria Research Division, under Dr. R. Green, much important work was carried out. It was found that during the administration of quinine to patients suffering from malignant tertian malaria, the percentage of cases showing crescents rises with treatment; on the other hand the addition of small, non-toxic doses of plasmoquin rapidly destroys the crescents. A proprietary drug (Aseplene) widely advertised throughout Malaya as a cure for malaria, was found to be useless, and the Division intends to go on investigating and publishing its results with such proprietary 'remedies' in order to give the public correct information with regard to their value or otherwise. A very careful study has been made of the local anopheline fauna, and a summary of records of anopheline breeding places embracing the results of over 20,000 collections was prepared for publication—a work that will be of great value to malariologists everywhere. Crude oils from rubber were found to be effective larvicides, but not cheaper than the oils now in use. An important finding is that *A. maculatus* is capable of adapting itself to breeding places vastly different from its natural habitat, and that the specificity of breeding places of different anopheline species is less marked than is usually supposed.

A precipitin test for malaria has been worked out, using as an antigen an alcoholic extract of spleen from patients with *P. falciparum* infection. Quinine troposan (May and Baker) was tried in treatment; this contains about 50 per cent. of quinine and 40 per cent. of troposan (an isomer of stovarsol), the compound containing 11 per cent. of arsenic. Forty cases were treated and results were good, parasites disappearing in from 2 to 6 days. (The usual difficulty, that patients will not remain longer in hospital than 9 to 12 days.

was encountered. The only satisfactory method of testing out such new remedies for tropical diseases appears to be among military or police populations, or in jails, where the patients are under disciplinary control, and can be observed over prolonged periods after the completion of treatment.)

Leptospirosis is of importance in Malaya, and 7 cases have been seen recently in European patients. Muscular pain and acute tenderness in the calf are constant symptoms. Jaundice was present in only one of these patients, but all showed fever of sudden onset, with constant albuminuria, and there was a rash in five. Photophobia and conjunctival irritation are also important features of the disease. Two of the European patients were tin-miners and leptospira were cultivated from a well supplying the staff of one of the mines from which one of the patients came. The leptospira strains isolated proved pathogenic to guinea-pigs.

An important piece of work carried out during the year was an investigation into the etiology of *ulcus tropicum*, of which disease 528 cases were studied. Chinese mining coolies especially are affected, whilst an interesting point is that the condition is hardly ever seen in children. Concurrent diseases such as malaria, dysentery, ankylostomiasis, and beriberi, are commonly present. Food deficiency is believed to play an important part in the development of the disease. Bacteriological investigations were carried out in 60 cases. About 0.1 c.c. of blood was collected aseptically from the surface of the ulcer in a capillary tube, and this then plated on blood agar, after clotting had occurred. The organism most constantly present was a small hæmolytic coccus, pleomorphic in arrangement, Gram-positive, and producing greenish discoloration in media containing whole blood. It proved non-pathogenic to guinea-pigs. Diphtheroid organisms were also obtained from the majority of ulcers. These invariably produced nodular infiltration, followed by local abscess formation, when injected into guinea-pigs. Two out of twelve strains isolated corresponded in every respect with the diphtheria bacillus, and a further eight with the definition of diphtheria bacilli given in the Medical Research Council's publication on diphtheria.

Different lines of treatment for the disease were tested. Eusol cleans up the ulcers fairly quickly and gives a granulating surface. A thin wood oil, prepared by the Malayan Wood Distillation Co., was also tried, and gave good results; it should not be applied for more than eight days, as prolonged application is apt to be followed by necrosis. There does not appear to be any royal road to the treatment of *ulcus tropicum*: "it would appear from these and other observations carried out during the year, that if a sound surgical procedure is adopted in dressing tropical ulcers, and the patient be well fed, it matters little what dressing is used."

Leptotic fever or the "leprous reaction" was investigated. It appears to have its origin as an acquired condition of allergy towards *M. lepræ* already in the tissues. The Rubino reaction for the diagnosis of leprosy was tested; this depends on the rate of sedimentation of the erythrocytes in a specially prepared suspension of formalinsed sheep's corpuscles, and it was found to be positive in all cases of active leprosy, and negative in the non-leprous controls. The Kahn and Wassermann tests are now carried out at Kuala Lumpur as a routine in all cases of leprosy. Intramuscular injections of Alepol proved to give better results than treatment with E. C. C. O., whilst Krysolgan was found especially useful in cases with ocular manifestations. The use of sanocrysin in pulmonary tuberculosis was continued; the drug appears to protract the course of the disease in the Asiatic patient, but offers little hope of cure.

Dr. Allen's report closes with a record of interesting cases seen during the year. A patient died on the 11th day of a febrile illness resembling typhoid fever, with grey hepatisation of the left lung; an organism was

isolated from the ulcers in the intestine corresponding to *Eberthella belfastensis* V of Wilson. Two cases of septicæmia with *B. faecalis alkaligenes* are recorded. Five cases of cutaneous blastomycosis were seen during the year. One was a case with extensive lesions on the arms, legs, chest, face and behind the ears. Potassium iodide in large doses is almost a specific for this infection.

The Pasteur Institute section examined 157 brains for rabies, and treated 193 patients and 1,981 dogs. Instead of purchasing vaccines from England and elsewhere, the Bacteriological Division prepared stocks of plague, cholera, and typhoid-paratyphoid vaccines for issue during the year. The routine work was greatly increased during the year, chiefly as the result of the appointment of thirty new medical and health officers to the F. M. S. during the year. Wassermann reactions carried out numbered 15,772, and it is noted that 10 per cent. of sera received are hæmolyzed or otherwise unfit for examination. Specimens should be sent by special messenger where possible, rather than entrusted to the post. The Kahn reaction, tested in 3,383 instances, gave a 95 per cent. agreement with the results of the Wassermann reaction on the same sera. Three *Bulletins* and five other papers were published by the staff of the Institute during the year.

Dr. Allen's main report as acting Director is followed by reports by the officers in charge of the different sections and divisions. In the Chemical Department, Mr. R. W. Blair records a large volume of routine chemical, toxicological, and also a special investigation on tests in malaria. The preparation of vitamine B extract on a large scale was continued, and 23,129 fluid ounces of this preparation were issued during the year. The beriberi-preventing properties of this product are tested on fowls, and the efficiency of absorption is from 85 to 90 per cent. Results of analyses of water supplies and of country liquors are given. In the report of the Pathological Department, Dr. P. H. Martin deals first with the year's work in the Pasteur Institute section, and the usual standardised tables are given. Three cases of fatal ascariasis, due to multiple abscesses of the liver caused by migration of round-worms, were discovered at autopsy on three Tamil children. Three cases of meliodosis were diagnosed at post-mortem, *B. whitmorei* being isolated from each. The use of fresh extract of liver of sheep and goats was further tested in tropical anemias; "in addition to specific treatment of malaria or hookworms," writes Dr. Martin, "liver treatment seems especially indicated in those cases which fail to respond to the usual treatment of their anemia with iron and arsenic with quinine, and it is possible that it may succeed in the type of case which otherwise continues for months without improvement, and which finally ends fatally with some intercurrent secondary infection." Autopsies in the department (excluding medico-legal cases) numbered 1,013; of which 278 were on cases of dysentery terminating fatally—235 of bacillary dysentery, 40 of intestinal amœbiasis, and 3 mixed. Tuberculosis, malaria, and pneumonia were three other very important causes of deaths.

The report on the entomological division by Mr. B. A. R. Gater, is of considerable interest. The ecto-parasites of rats were studied, and at least sixteen different species—most of them mites—discovered; if the vector of tropical typhus is a mite parasitic on rats, there is a considerable field awaiting investigation. Examination of the flowers of oil palms—trees which are closely associated with cases of tropical typhus—revealed an almost incredible infestation with mites belonging to five different families. The relationship of *Anopheles maculatus* to rice fields is under investigation. The most important work of the year was a careful and close investigation of the Malayan *Anophelines*, since it was discovered that much previous investigation was spoilt by the non-recognition of sub-species and variants. The longevity of *A. maculatus* under different conditions of food and environment was investigated, and its bearing on the malaria problem of the F. M. S.

Sodium silicofluoride was found to be an effective mosquito larvicide, and also commercial calcium cyanide, but the toxicity of the latter compound to animal and plant life needs investigating. A further investigation carried out dealt with the different genera and species of flies found breeding in manures and latrines.

The report on the malaria research division by Dr. R. Green is full of interest. The relationship of quinine administration to crescent counts is here more fully considered. To rid the patient of "crescents" it is advocated that four tablets of plasmoquine compound be given each morning and night,—a total dosage of 0.04 gm. of plasmoquine and 0.5 gm. of quinine sulphate a day; under this regime crescents disappear in an average of 7.9 days. Only 3 out of 56 patients so treated showed any toxic symptoms, and these consisted only of minor abdominal pains. Unfortunately, however, this dosage does not contain sufficient quinine to destroy all trophozoites, and the ideal which Dr. Green suggests is a daily dosage of plasmoquine 0.04 gm. with quinine sulphate gr. xx, which should prove both effective and non-toxic. For the time being, he considers that plasmoquine should only be administered to patients under full medical supervision. In quartan malaria plasmoquine was a more efficient gametocide than quinine, gametocytes being absent in the films after 10 days of plasmoquine therapy, as against 15 days with quinine. A dosage of 0.04 to 0.06 gm. of plasmoquine daily appears to be both safe and non-toxic.

Dimeplasmin gave very disappointing results, all the 11 patients tested having to be finally put on quinine therapy after 6 to 11 days' administration of Dimeplasmin. Aseplene was useless. The blood grouping of patients with malaria was tested, but patients of all blood groups appear to be equally susceptible to infection. A special investigation carried out during the year dealt with the effect of malarial infection on the activity of the pancreas; the glucose tolerance test showed that there is generally deficiency in sugar storage capacity in malaria. Notes are given of various and numerous experimental investigations which were still not completed, and some useful hints on methods of staining for malaria parasites.

#### ANNUAL PUBLIC HEALTH REPORT OF THE CENTRAL PROVINCES AND BERAR FOR 1928. BY C. M. GANAPATHY, MAJOR, I.M.S., DIRECTOR OF PUBLIC HEALTH, CENTRAL PROVINCES. NAGPUR: PRINTED AT THE GOVERNMENT PRESS, 1929. PRICE, RE. 1-8-0.

THE biological phenomena in the Central Provinces are what we would expect in a dense population of comparatively primitive people. The birth rate is high, 46.50 per 1,000, the infantile mortality rate is high 238.41 per 1,000 and accounts for one-third of the total mortality in the province; parasitic interplay is rife and cholera, plague, small-pox and fevers levied a heavy toll of life; the death rate is high, 33.66, and the natural increase after all these biological phenomena were finished, was 12.85 per 1,000.

A parasitic disease of plant rust attacked the rabi crop and produced famine conditions in many districts. In spite of such fundamental difficulties, the Health Department achieved very notable work. The enormous wastage in young child life has attracted much attention and all over the province the development of infant welfare centres has been a feature; 14 new centres were opened during the year, making the total of 35. In Nagpur city, notable achievements in saving child life were accomplished. *Fevers and malaria* accounted for more than half the deaths in the province; there are several hyper-endemic malarial areas and special dispensaries were sent to these. *Cholera* carried off 12,198 people; the Central Provinces shared in 1927-28 rise of epidemic cholera; it is an epidemic area and imports its cholera from outside, from Puri and Pandharpur mostly. Voluntary inoculation was fairly successful throughout the villages. *Plague* killed 3,770

people; rat destruction was strongly advised by Government and grants were offered to municipalities for this purpose but the response was poor in many instances. The destruction of one rat per head of the population per annum should be the aim of this anti-plague measure. *Leprosy* received great attention and a survey of two divisions was made. The incidence discovered was found to be much higher than was previously supposed. A Public Health Institute has been established and examinations of water supplies and food are being done. Government granted 1½ lakhs to various bodies for improvement in water supplies; this represents a contribution of 67 per cent. to the cost of the schemes. It is not apparent from the Report what staff the Director of Public Health has to assist him, though the work of two Publicity Officers is maintained. Nagpur and Jubbulpore have Health Officers, but Amraoti, it is reported, is thinking of giving up its Medical Officer of Health. In the other municipal towns trained sanitary inspectors supervise the sanitation. We congratulate the Director of Public Health and his staff on the evidence of good work during the year, compliment them on their optimism and wish them every success in what must be a very up-hill fight, where results are slow and long in coming.

## Correspondence.

### IS MEDICINE FULFILLING ITS RESPONSIBILITIES TO FUTURE GENERATIONS? A PLEA FOR THE STUDY OF EUGENICS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—This century can correctly be designated as the century of progress, and of all sciences that have advanced, surgery and medicine stand foremost. The former has accomplished marvels and the latter much. The eugenicist, however, is not apt to endorse this view.

To begin with, the physician in all his dealings with disease ignores, generally speaking, the hereditary factor, though this largely decides whether any individual man or woman will succumb to a particular disease or not. More than two thousand years ago Aristotle wrote these pregnant words. "Men are called healthy in virtue of the inborn capacity for easy resistance to those injurious influences which may ordinarily arise, and unhealthy in virtue of a lack of that capacity." Medicine would therefore greatly gain by a study of the principles of heredity and genetics.

Medicine ignores the future generations and concentrates all its attention on the present. Even in the present generation it has so far been able only to defeat the microbe but not to effect any permanent improvement in the defences of the human body. To illustrate this point, the eugenicist quotes diseases like arthritis, insanity and epilepsy which depend on the very constitution of man itself and nothing has yet been discovered in the way of curing these, though it is possible now to increase the comfort of the persons affected. Should not the ultimate aim of medical science be to make man himself ward off disease? This can be accomplished only by increasing the vitality of the race, or in other words by preventing the feeble in mind and constitution from transmitting their defects to their descendants, that is to say, from parenthood.

What good does it do to cure the ailments of this generation which is sure to die out within the next few decades, if we take no precautions that these very ailments are not transmitted to future generations? The feeble-minded and the biologically unfit class are increasing about three times as fast as the best human stock. In England, now one in every 40 persons is mentally defective, and while in the last 21 years the normal population has increased only 14 per cent., the aments have increased over 100 per cent. (*Report of the Mental Deficiency Committee, 1927*). This state of affairs is mainly due to neglect of future generations. About a third of the income of every state is being



spent directly or indirectly on maintaining defectives. The eugenicist claims that the number of insanics can be halved within the next fifty years if they were prevented from procreating. A little thinking will convince us that this is no idle boast. Here it is a question of an ounce of prevention being worth pounds of palliative treatment.

The physician judges the gravity of a disease largely in accordance with the probability of death being the immediate result, ignoring in his ignorance the amount of suffering likely to be caused to those who acquire the disease in future generations and taking no precautions to prevent this calamity. Then again he enquires into the causes of disease only as leading to methods of cure, not taking into account the probability of the defect reappearing in the offspring which appears to be no concern of his.

The eugenicist has yet another complaint against Medicine and this is very suggestive—namely, Medicine gives a sense of false security to persons it “cures.” Hundreds of instances can be quoted to support this charge. The tuberculous, the insane, the epileptic and others affected with transmissible ailments who would in former times have been quite invalided or have died out, probably without leaving any descendants, are now “cured” and left apparently healthy to procreate tainted offspring. A well known eugenicist in England writes “Here in England I believe a good deal of maternal mortality is due to the fact that improved obstetrics covering now two generations are leaving in each generation a higher proportion of women in the community whose pelvic formation is not suited to child-bearing. Such groups were formerly eliminated by child-birth owing to lack of proper obstetrical aid.” Thus improved obstetrics are causing increased maternal mortality, certainly a paradox! Improvements in medicine and surgery therefore exert a decided dysgenic influence. Instances will occur to every medical man when he, in his desire to cure disease, has completely lost sight of the claims of coming generations and even of heredity. A tuberculous mother is “cured” and the doctor leaves instructions how to ward off the disease from the other members of the family, but never how she is not to have any more children, though he is fully aware that another pregnancy would probably result in the death of the mother and the birth of a tainted baby. The same thing happens in insanity and similar other diseases. The doctor may drop a hint that another pregnancy might mean disaster but never advises how to prevent it as he himself does not know how. Medicine is confronted with this problem every day and still it does not bestow on it the attention it deserves because the subject is taboo.

Eugenics is the study of agencies under social control that may improve or impair the racial qualities of future generations either physically or mentally, and hence is like a vast ocean whose waves touch all the shores of human activities. In every one of its aspects which touches medical science, the latter hopelessly falls short of the eugenic ideal. Take the case of venereal diseases. The physician cures the disease without bestowing any thought whether it has left any effect on the persons' generative functions.

In no aspect of eugenics is the physician so ignorant as on sex and its problems. He does not realise that sexual appetite, after hunger, is the most dominating influence in the life of human beings and is insistent. Professor Freud asserts that the majority of nervous morbid states are produced by certain pernicious influences of the sexual life. Even though we may not go so far as Professor Freud we cannot but be convinced if we care to inquire that a large proportion of these cases has a sexual import. Dr. Marie Stopes quotes from a German obstetrician that over 70 per cent. of cases of chronic pelvic pain and allied disorders in the female are due to incomplete sexual gratification or sexual irregularities. Yet we see even eminent physicians treating such cases with injections, hydrotherapy, and other modern medical inventions, when all that is needed is a little inquiry

into the sex life of the person and the required advice or correction.

The present day morality forbids the discussion of subjects like birth control, sex, etc., even among physicians and this causes neglect of these vital subjects with the result that untold misery and suffering are imposed on the people. It makes one ask with Freud “Is our civilised sexual morality worth the sacrifice and suffering it imposes on us?” The suffering and sacrifice according to Professor Freud are increased unhappy marriages, divorces, judicial separations, sexual perversions, prostitution, abortion, mental derangements, lack of vitality and so forth. Is medicine helping future generations to be born healthy, mentally or even physically? Decidedly not. The study of eugenics by medical men and women is the only way to solve this difficulty.

I have touched only on a few points in connection with this subject, but it is hoped that it will stimulate a healthy curiosity among the members of my profession.

The Society with which I am connected will give every help to those who wish to study the subject.—Yours, etc.,

A. P. PILLAY,

Captain, O.B.E., M.B., B.S.,  
Honorary Medical Director,

The Sholapur Eugenic Education Society.

SHOLAPUR,

5th October, 1929.

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

MAJOR-GENERAL J. W. D. MEGAW, C.I.E., M.B., K.H.P., I.M.S., Surgeon-General with the Government of Madras, was appointed to officiate as Director-General, Indian Medical Service, with effect from the afternoon of the 24th March, 1930, and was confirmed in that appointment, with effect from the 1st April, 1930.

His Excellency the Viceroy and Governor-General has been pleased to make the following appointment on His Excellency's personal staff.

#### To be Honorary Surgeon.

Colonel J. Fuller-Good, M.B., I.M.S., vice Colonel L. J. M. Deas, M.B., F.R.C.S.E., I.M.S., retired. Dated 11th July, 1930.

Major B. Z. Shah, M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., is appointed to officiate as Superintendent of the Ahmedabad Central Prison, pending further orders vice Mr. W. Laxton, and as Medical Officer of that Prison, vice Mr. R. M. Fouzdar, I.M. & S., B.M.S.

Major S. R. Prall, I.M.S., is appointed to be Resident Medical Officer, St. George's Hospital, Bombay, relieving Major J. H. A. Donnelland, I.M.D.

The services of Captain G. H. Fitzgerald, I.M.S., are placed temporarily at the disposal of the Government of Assam, with effect from the 26th May, 1930.

#### LEAVE.

The Hon'ble Major-General Sir Henry Symons, K.B.E., C.S.I., K.H.S., I.M.S., Director-General, Indian Medical Service, was granted leave under Fundamental Rule 86 preparatory to retirement on average pay for 5 months and 24 days, combined with leave on half average pay for 7 days, with effect from the afternoon of the 24th March, 1930.

Lieutenant-Colonel K. S. Singh, I.M.S., Civil Surgeon, Jullundur, has been granted 2 months' leave, with effect from 20th June, 1930.

Major G. Shanks, I.M.S., Professor of Pathology, Medical College and Bacteriologist to Government, is allowed leave for 2 years and 28 days, with effect from the 29th July, 1930, or any subsequent date on which he avails himself of the leave.

Major H. E. Murray, M.D., M.Ch., I.M.S., Civil Surgeon, Bakarganj, is granted leave on half average pay for 2 months, with effect from the 28th April, 1930.



Captain H. W. M. B., I.M.S., a temporary officer of the Department, employed under the Indian Research Fund Association, was granted leave on average pay for 1 month, with effect from the 8th April, 1929, and his services were placed at the disposal of the Director-General, Indian Medical Service, during the period of the leave.

#### RETIREMENTS.

Lieutenant-Colonel J. C. Clements. 25th February, 1930.

Lieutenant-Colonel C. L. Dunn, C.I.E. 15th May, 1930

#### PROMOTIONS.

*Lieutenant-Colonel to be Colonel.*

H. R. Nutt, M.D., F.R.C.S. Dated 5th November, 1929

*Captain to be Major.*

T. H. Thomas, M.R.C.P. Dated 8th April, 1930.

Captain (Prov.) K. F. Alford is confirmed in his present rank.

## Notes.

### "CINCHONA FEBRIFUGE" TABLETS.

We have often drawn the attention of our readers to what "quinine" or "cinchona febrifuge" tablets on the Indian market may consist of, but a glaring example of fraud has recently been submitted to us by Dr. Hugh H. Linn, M.D., of the All-India Missions Tablet Industry, Bowringpet, South India.

A certain firm in northern India advertised cinchona febrifuge tablets at an extremely cheap rate, a rate with which the All-India Missions Tablet Industry could not compete. A supply of these cheap tablets was purchased and submitted to a provincial Chemical Examiner for analysis. The average weight of each tablet was found to be 5.3 grains. After digestion with chloroform, and removal of the insoluble matter by filtration, the amount of insoluble matter was found to be 65.5 per cent., consisting mainly of glucose and starch. Now according to Martindale's *Extra Pharmacopœia* cinchona febrifuge should contain 83.77 per cent. of alkaloids and 16.23 per cent. of ash; the sample sent was therefore further examined for its ash content, which was found to be 14.9 per cent., mostly consisting of magnesium sulphate.

As all the alkaloids of cinchona febrifuge are soluble in chloroform, the amount of inert matter in this sample was 65.5 instead of 16.23 per cent. In brief, the tablets contained only 34.5 per cent. of the alkaloidal content that they should have contained for their weight. The adulteration was over 50 per cent.

The moral is that in buying quinine and cinchona febrifuge tablets one must be certain of the good faith of the vendor.

Together with Dr. Linn's report, we have received a price list of the All-India Missions Tablet Industry, to which we should like to draw the attention of our readers. The prices are studiously moderate and the good faith of the vendors cannot be impeached. The anti-malarial tonic tablet, which contains cinchona febrifuge, ferri redactum, arsenious acid, and strychnine, appears to be a most suitable one for administration in convalescence after malaria, and is listed at Rs. 9 per tin of 1,000 tablets.

### "CATADYN" STERILISATION OF WATER.

A NOVEL and interesting departure is the introduction of a new method of water sterilisation—the "Catadyn process." The Swiss biologist, C. von Nageli in 1893 reported that when water is kept for several weeks in metallic containers of silver, copper, etc., all its contained micro-organisms are killed; to this phenomenon he applied the term "oligodynamics." Recently Dr. G. A. Krause of Munich has shown that this

phenomenon depends on the quality of the metallic surfaces concerned; if the metal is present in laminated molecular form, active molecular oxygen is accumulated; this oxygen generates metallic salts which go into solution in the form of ions. The ions kill the bacteria by transmission of the electrical charge upon them. Silver is the metal with the most potent bactericidal properties and has also the advantage of being without deleterious effects on the higher organisms. The application of this method has been termed the "Catdyn method" by its author. The time required for rendering the water bacteriologically sterile depends on its bacterial content, but as a rule a contact of two hours is prescribed. Such treated water retains its bactericidal properties indefinitely; the method kills all bacteria in the water, but leaves yeasts and animal organisms alive; the silver layer of the contained flasks maintains the bactericidal property for years; the method requires no personal attention; the treated water contains more oxygen than normal and undergoes no deleterious change in taste or appearance.

The Catadyn method has now been applied commercially by a number of German firms, and a very wide field for its use appears to be opening up. The Catadyn flasks are made of glass, clay or porcelain. They are filled with porcelain rings coated with refined silver. Contaminated water poured into such flasks and left there for two hours becomes bacteria-free. There are several different types of such flasks; porous cooling-flasks, soldiers' water bottles, Thermos flasks, jugs and portable vessels, whilst the principle has also been applied to reservoirs of different type, both small and large. Filters of every type for the use of troops, railways, and ships can be "catadynised." A household steriliser combines the Catadyn flask plus the usual candle filtration methods. A method of sterilising the water in swimming baths by continuous circulation through a Catadyn steriliser has been introduced. Further, the treated water retains its bactericidal properties, and use can be made of this fact to transmit the bactericidal property to glass, porcelain, clay, paper and other fibrous tissues. Thus further uses of the method are an air steriliser, "Catadyn" ice, the sterilisation of natural mineral waters, "Catadyn" bolus alba and toilet powders, and the use of treated water as an antiseptic lotion in kitchens, hospitals, ships, dairies, etc.

A report from the Counties Public Health Laboratories testifies to the bactericidal properties of "catadynised" water against *B. coli*, but also notes that the destructive action requires a comparatively long time for its completion. The method, however, appears to hold out the promise of very great developments in water sterilisation. The British agents are Messrs. Duncan Stratton & Co., Sentinel House, Southampton Row, London, W.C. 1.

### B.D.H. VITAMIN PRODUCTS.

A SMALL brochure recently issued by the British Drug Houses, Ltd., Graham Street, City Road, London, N. 1, deals with their vitamin products. A description of the methods of preparation and standardisation is given for each product. Radiostol is prepared by irradiation of ergosterol to the optimum point, and is standardised according to the method of Coward, the solution to 10,000 antirachitic units per c.c., and the pellets to 6,000 antirachitic units per pellet. Radiostol is of value in the prevention of rickets, tetany, marasmus, in promoting the development of the teeth, and in dental caries. It is recommended for all conditions arising from faulty calcium and phosphorus metabolism.

Radiostoleum contains Radiostol and vitamin A, standardised by the method of Carr and Price, and also physiologically. It is claimed that it possesses 100 times the vitamin D activity and 20 times the vitamin A activity of good cod-liver oil. It has been used with good results by Mellanby and Green in the treatment of puerperal septicæmia, and is recommended for use during the last two months of pregnancy and during

lactation. Infants, whether breast fed or artificially fed, benefit by its administration. Its vitamin A content helps to build up resistance against infectious diseases, whilst in view of its vitamin D content it is of use in preventing and in the treatment of dental caries.

Radiomalt is stated to contain Radiostoleum, plus vitamins B<sub>1</sub> and B<sub>2</sub> in physiologically standardised quantities. It is of value in building up resistance against infection, as a safeguard against epidemic influenza, in periods of stress, and during pregnancy.

This small brochure is of interest in its clear exposition of vitamin therapy and the experimental results given in graph form.

### THE INJECTION TREATMENT OF VARICOSE VEINS.

Those of our readers who used intravenous injections of sodium morrhuate in the days when it was first introduced by Sir Leonard Rogers for the treatment of pulmonary tuberculosis will probably admit that they were troubled by the occurrence of thrombosis. Under such conditions it is of interest to note that intravenous injections of sodium morrhuate are now being advocated for the sclerosing treatment of varicose veins. The following is an abstract of a note on the method by the British Drug Houses, Ltd., Graham Street, City Road, London, N. 1.

An article (*Lancet*, Jan. 11th, 1930, p. 68) describing the successful treatment of a series of cases of varicose veins by the injection of Sodium Morrhuate B.D.H. is an indication that this product may prove a useful addition to the list of therapeutic agents employed for this purpose.

Sodium Morrhuate B.D.H. consists of the sodium salts of the purified unsaturated fatty acids extracted from cod-liver oil. It forms a dark brown, soapy solution in water. Cold weather is liable to produce slight coagulation, but this is dispersed easily by warmth.

Solutions are supplied containing 0.5 per cent. phenol which has no therapeutic value, but which acts as an efficient preservative.

Sodium Morrhuate B.D.H. appears to be non-toxic even when administered in large doses; it is stated to be rapid, reliable and safe, in its local action, the risk of periphebitis and necrosis being described as negligible.

Treatment with Sodium Morrhuate B.D.H. is reported also to possess the further advantages of being practically painless, entirely localised in action and quick in effect.

#### Method of Administration.

According to the surgeons whose work is referred to above, Sodium Morrhuate B.D.H. appears to be most effective when injected into a distended vein; the patient is, therefore, best treated whilst in a standing position; in the case of very large veins, however, the horizontal position may be preferable.

An all-glass syringe is recommended, and the injection should be given rapidly. The puncture seals itself quickly, and there is no extravasation; in consequence, a series of successive punctures may be made with safety.

It is recommended that injections be made from above downwards, spacing the punctures at intervals of about two inches along the vein. On withdrawing the needle it is advisable to compress the skin temporarily whilst the succeeding injection is given.

The patient should lie down for a few minutes after treatment. If the wounds do not heal up quickly a drop of collodion may be used; no bandages are required.

As a rule one sitting is sufficient, but if for any reason the treatment cannot be completed at one time two sittings with a weekly interval may be given. It is advisable that the patient should report at the end of a month, when further injections may be given if necessary. The shortness of the course is regarded as an advantage over other forms of treatment.

#### Dosage.

In the majority of cases a 5 per cent. solution of Sodium Morrhuate B.D.H. is strong enough to obliterate the lumen with a minimum amount of inflammation, the degree of inflammation being directly proportional to the amount injected.

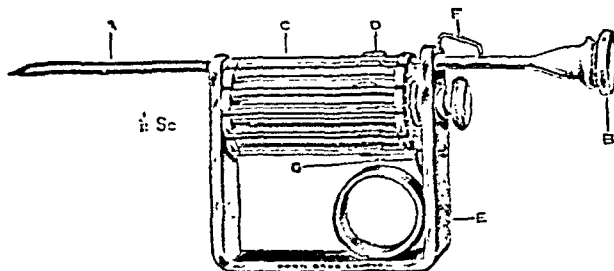
In a few cases a 5 per cent. solution is too weak to cause the desired effect, and in such cases a 10 per cent. solution may be employed.

Usually 0.5 c.c. to 1 c.c. is sufficient for each injection, the size of the vein being the determining factor. The total dose should not exceed 10 c.c., and, as a rule, this large quantity is not required. Over-dosage must be avoided lest periphebitis ensue as a result of excessive inflammation; with the correct dosage this condition may be avoided almost entirely.

Sodium Morrhuate B.D.H. is issued in sterile solution, preserved with 0.5 per cent. phenol, in ampoules of 5 c.c.

### AN IMPROVED RADIUM NEEDLE INTRODUCER.

By Mr. RALPH BROOKE, M.S.



The instrument consists of a hollow trocar A, with a bevelled needle point. The trocar is slotted on its upper surface, and in it passes the stilette B. C is a revolving cylinder which measures 1½ ins. in length, and contains 12 chambers each slotted on their outer surface. These chambers are for the reception of the radium needles. Each chamber is loaded with a threaded needle before use, and the threads are drawn out of the slots on the outer surface, and passes beneath the small metal plange D which anchors them until they are required. E is the handle by which the instrument is held.

The trocar is first introduced into the tissues with the stilette in position. When the required depth has been reached the stilette B is withdrawn. The catch F is a restraining catch and prevents it being drawn out completely. The cylinder is then rotated until the first chamber comes into line with the trocar. This point is automatically regulated by a ball catch G. The stilette is then pushed home, and the threaded needle is forced through the trocar into the tissues, the thread lying in turn in the slot on the upper surface of the chamber, and then in that of the trocar. The stilette is then withdrawn, the cylinder again turned until the next chamber is engaged and a second needle introduced. Or the trocar may first be withdrawn and reintroduced at a fresh spot.

The value of this instrument lies in the fact that the time wasted during the operation in the threading of needles and in the introduction of these needles with forceps by the surgeon into the trocar each time is obviated. The needles are all threaded by the sister before the operation commences, and the chambers ready loaded.

(Manufactured by Messrs. Down Bros., St. Thomas' St., London, S.E. 1.)

#### PETROLAGAR.

THE treatment of chronic constipation is as important in the practice of medicine in the tropics as in the temperate zones, for the practitioner in the tropics has not only to deal with the habitually constipated female

patient, but is also faced with the difficulties of treating constipation as a sequel to dysentery and other acute infections of the colon.

The general opinion with regard to saline purgatives is that whilst they are specially indicated under certain conditions, their use in habitual constipation is not advisable. Liquid paraffin varies in its effects in different subjects; in some it will cause a violent evacuation of the bowels, in others it is inert.

Of the many preparations on the market which avoid both these difficulties, Petrolagar is one of the most elegant and useful. We have had considerable experience of its use and have been satisfied with the results. The makers—the Petrolagar Laboratories, Braydon Road, London, N. 16—claim that it is a mechanical emulsion of 65 per cent. of liquid petrolatum and agar. The oil in it is atomized by hydraulic pressure and remains in a finely divided state. Its action is purely mechanical, non-irritant, and habitual use of it does no harm. It is non-nauseating and is miscible with water. In a booklet which the makers send out, the many uses of this preparation are described. It is a useful aperient for children; it is especially suitable for obstetric and gynecological cases, and also before operation. Petrolagar Alkaline is of value in the treatment of gastric and duodenal ulcer, also in tropical affections of the intestine where a bland and soothing action is required. It can also be administered by enema, and is especially suitable for patients suffering from hæmorrhoids.

Several modifications of the original Petrolagar are described, each for its appropriate use in selected cases. It is one which is certainly useful in the treatment of constipation in the tropics.

#### BOVRIL, LIMITED.

PRESIDING at the Thirty-third Annual General Meeting of Bovril, Limited, held on February 19th at River Plate House, London, the Chairman, Lord Luke, said that it was with pleasure that they met the shareholders again and had the opportunity to present to them such a very satisfactory Report and set of Accounts.

Not only did the sales of Bovril in 1929 surpass all previous records, but the increase was at an accelerated pace. The year showed a larger increase over its predecessor than had been achieved in any previous year with the one exception of 1919, when conditions were abnormal. They had been restricted with regard to overseas sales in 1914-1918, and went forward with a bound when the restriction was removed.

He had told them at the last meeting that each year since the War had shown an increase in the export of Bovril, and again, he could say that in 1929 overseas sales had exceeded 1928 and its predecessors. They had every reason to be pleased with their world-wide sales progress.

They continued to challenge public attention with their ever changing slogans, and public appetite for them seemed to grow with every fresh one they put out.

Sir James Crichton-Browne, M.D., F.R.S., said he had been recalling that an Irish gentleman, who, like their Chairman, Lord Luke, was interested in Hospitals and Charities, upon one occasion, when appealing for funds for a special Hospital, said: "Ladies and gentlemen, most public institutions have their ups and downs, but unfortunately, in the case of this hospital, the downs have been in the ascendant."

Well, it must, he thought, be satisfactory to them that day to realise that in the case of the public institution with which they were concerned (that is to say, Bovril) the ups had been in the ascendant, for the consumption of Bovril last year was higher than it had ever been before. It grew steadily in public favour.

The body-building power of Bovril generally was well established, and of that he need say nothing, but he would like to point out a special service Bovril could render in connection with the nutrition of children. They would probably have noticed that the prevalence of diseases of the heart in connection with

rheumatism had been engaging the special attention of the Ministry of Health. Diseases of the heart and circulatory system held the first place in the causes of mortality in this country. They were nearly twice as fatal as cancer. Well, as regards heart diseases, a large proportion of them originated in rheumatic infection in early life between the ages of 5 and 15, the true nature of which was often overlooked. The child was pale and seedy, complained of growing pains as they are called, or aching in the joints, twitchings, or suffered from loss of appetite, but no particular notice was taken of what seemed a trifling ailment for which even interruption of school attendance seemed unnecessary, while all the time the seeds were being sown of crippling and perhaps deadly disease.

No doubt a micro-organism was at work, taking advantage of defects of inheritance or environment, but the point to note was that the healthy and well-nourished child did not become rheumatic, but was able to resist the infection, while always during these rheumatic invasions there was loss of weight. The best protection against rheumatic invasion was good nutrition that maintained resistance, and the best treatment when invasion had occurred was good nutrition and rest, and so he believed that in the fight with rheumatism Bovril combined with fatty food—for one food helped another—might prove very efficacious.

They would recollect that the fliers by the Southern Cross came down in the wilds of Australia last April, and were given up as lost. Well, when they were ultimately discovered by the relief aeroplane, in the first parcel of food dropped to the starving men was Bovril, which proved immediately restorative.

Major Court Treatt, in his expedition to the Soudan last Autumn, took with him a supply of Bovril, and he wrote to say that he found it excellent, unaffected by climatic conditions, and invaluable in cases of sickness or debility after fevers.

Recent scientific research had shown that other metals besides radium were radio-active, and that potassium was one of these, giving off B rays which were essential to the functioning of the heart. Potassium could, of course, be derived from various dietetic sources, but Bovril, it appeared, contained just the right proportion of it.

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## Original Articles.

## THE CAUSATION OF LYMPH-SCROTUM.

By H. W. ACTON,

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Director, Calcutta School of Tropical Medicine and Hygiene,

and

S. SUNDAR RAO, L.M.P.,

Filariasis Research Worker, Calcutta School of Tropical Medicine and Hygiene.

ELEPHANTIASIS of the scrotum is a common manifestation of filarial infection and is frequently seen amongst those who live in endemic areas, e.g., Puri, Cuttack, Calcutta. It is rare amongst those who live in hyper-endemic areas such as Cochin, and in people living in places such as Allahabad, etc., where the chance of infection is small. This clinical condition should be carefully differentiated from lymph-scrotum. In elephantiasis of the scrotum, the tissues are greatly hypertrophied (*see Fig. 1*), the skin is hard to the touch owing to the fibrosis of the corium. Although the epidermis is thickened there are no dilated lymphatic



Fig. 1.—Elephantiasis of Scrotum.

cysts projecting from the surface, and consequently no discharge of fluid, lymph or chyle.

In lymph-scrotum (*see Fig. 2*) the lesion is different and can be readily differentiated. The



Fig. 2.—Lymph-Scrotum.

skin has a reddish-brown colour (*see Plate I*) contrasted with the darker elephantoid skin, it is soft and velvet-like to the touch, and projecting above the surface level in the skin are numerous dilated lymphatic villi, which form small cysts. From time to time, these rupture from even the slightest trauma and lymph or chyle oozes from the broken cyst. The scrotum is moderately enlarged in size and never assumes the huge size of elephantiasis of this region. There are, therefore, two definite clinical lesions that occur in this area—elephantiasis of the scrotum, and lymph-scrotum, both due to obstruction of the lymphatics by *Filaria (Wuchereria) bancrofti*, but in the case of lymph-scrotum, as we shall show presently, there is in addition the effect of trauma.

The mechanism by which elephantiasis of the scrotum and other parts of the body is produced has been worked out by us (Acton and Rao, 1929). We came to the conclusion that there were two factors producing this lesion, viz., the irritation produced by the filarial toxin, and in many cases a superadded septic infection. In the case of lymph-scrotum apparently nobody seems to have studied how this lesion is produced, as the most recent literature on the subject gives no definite explanation of the pathological lesion. The absence of a satisfactory explanation as to its cause may be due to the fact that the lesion is comparatively rare. Cruickshank and Wright (1914) do not mention any cases of lymph-scrotum in their studies at Cochin; Manson-Bahr (1912) does not record any case of lymph-scrotum in Fiji or

line drawn through the pubic spine, below by a horizontal line placed six or seven centimetres below Poupart's ligament. They are placed in the deep layer of the superficial fascia, and are in relation with the following subcutaneous organs in this region; the subcutaneous abdominal arteries, viz., the superficial circumflex iliac, superficial external pubic; the corresponding veins, the terminal portion of the internal saphenous vein, and the crural branch of the genito-crural nerve.

The number of these glands is somewhat variable. Moreover, to succeed in estimating them accurately it is essential that their afferent vessels should be injected; for injections, and more particularly coloured injections, enable us to discover small glands which in a simple dissection would certainly escape notice. It may then be seen that they vary in number from 10 to 20; their size is no less variable than their number. As a result of the constant infections to which they are exposed, they are not infrequently found hypertrophied.

On account of their number, and the large space occupied by these glands, the majority of anatomists divide them into several groups. We must remark, however, that all these divisions are absolutely artificial. On the one hand, all of them as a matter of fact are scattered about without apparent order, so that it is impossible to group them into distinct masses, characterised by a constant topography. On the other hand, though each of the different regions whose lymphatics are tributaries of the inguinal glands send by preference their vessels to certain of these glands, there is no arrangement sufficiently constant to serve as a basis for a natural classification. We recognise, however, the necessity for dividing the superficial inguinal glands into several groups, though we would again insist on the purely conventional nature of any division.

A horizontal line passing through the saphenous opening divides the superficial inguinal groups into two groups; a superior and an inferior. A vertical line passing through the saphenous opening divides each of these groups into two secondary groups, one external and the other internal. Finally, there is often a central group, formed by 1 to 3 small glands placed in the actual orifice of the internal saphenous opening. According to Leaf, it is not unusual to find one of these glands embedded in the fatty layer in the immediate vicinity of the saphenous opening, thus constituting a transition between the superficial and the deep glands.

To sum up—The superficial inguinal glands may be divided into five groups: (1) supero-external, (2) supero-internal, (3) infero-internal, (4) infero-external, (5) central group (para-saphenous glands of Quenu?).

The two superior groups are formed by a series of glands fairly regularly arranged below

the crural arch, and having their long axis parallel to it. The arrangement of the lower groups is much more irregular. Though the lowest are usually elongated in the vertical direction, parallel to the axis of the limb, the majority of them are round or oval and irregularly scattered about.

*Afferent vessels.*—The superficial inguinal glands receive the cutaneous lymphatics of the lower limb, the perineum, the scrotum, the penis, the prepuce or the clitoris, the anus, and the sub-umbilical portion of the abdominal wall. According to Sappey, the lymphatics of the glans penis and glans clitoridis both throw themselves into the superficial inguinal glands; but we shall see that this termination is exceptional and that these vessels are normally tributaries of the deep inguinal glands. The lymphatics of the lower limb terminate both in the infero-external and in the infero-internal group.

The lymphatics of the scrotum and the coverings of the penis usually end in the supero-internal group, but they may also end in the glands of the infero-internal group.

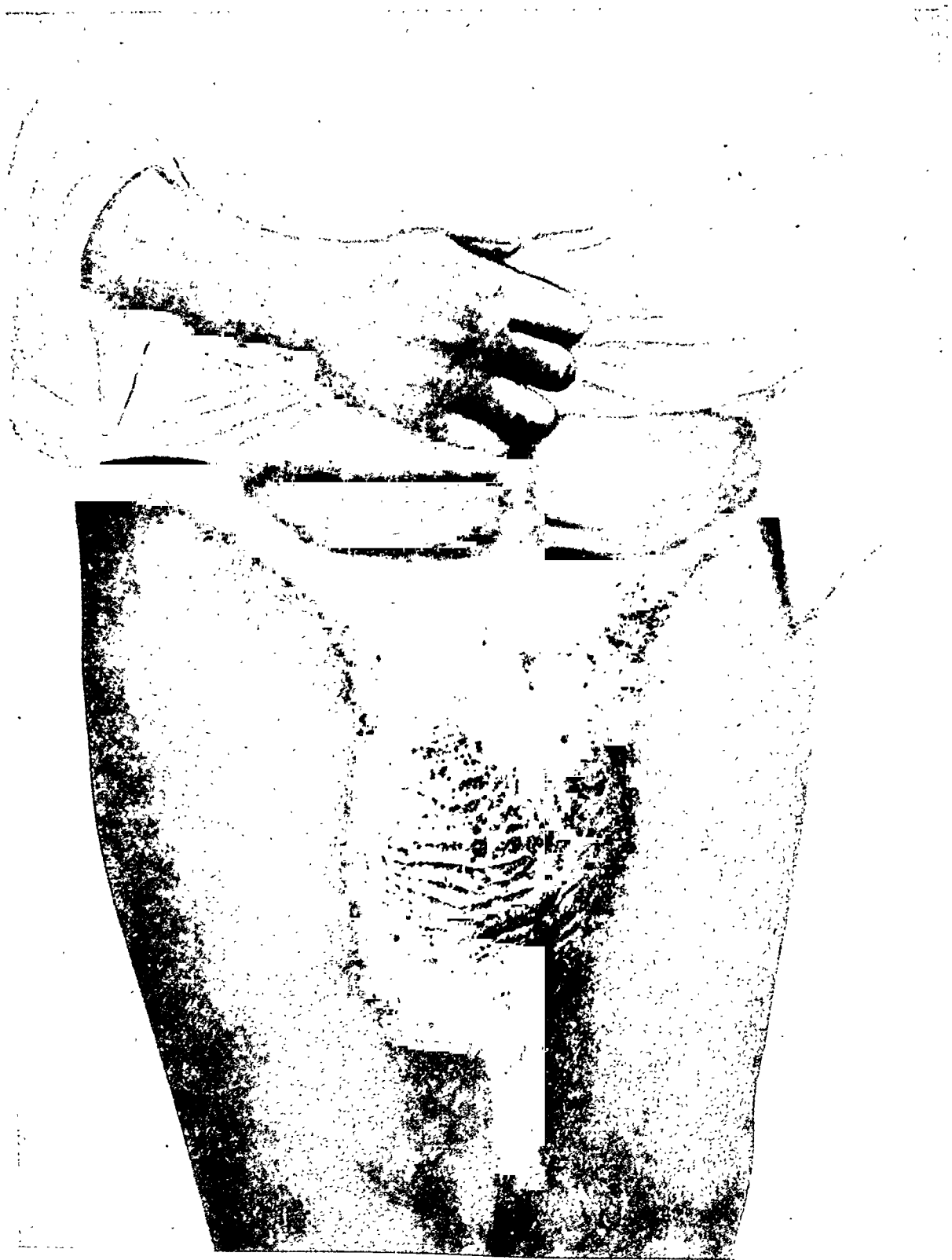
*Efferent vessels.*—The efferent vessels of the superficial inguinal glands end in the deep inguinal or in the external iliac glands. To reach these glands they must pass through the femoral sheath; there are numerous orifices through which they pass, which give to the upper part of this sheath its characteristic stippled appearance.

The efferents which terminate in the deep inguinal glands are the least numerous. They come especially from the glands of the two lower groups.

The efferents which terminate in the pelvis are much more important; they vary in number from 8 to 12, and are always of considerable calibre. They pass into the pelvic cavity through the crural ring, and accompany the femoral vessels. Some of them pass in front of these vessels, but the majority run along the inner part of the ring, internal to the femoral vein. At this point, some of them may be interrupted by the gland of Cloquet; but the majority end in two glands, viz., the external and internal retro-crural.

*Deep inguinal glands.*—The deep inguinal or sub-aponeurotic glands are much less important than the superficial glands. They vary in number from 1 to 3, and are not usually of large size. The lowest is placed below the point where the external saphenous joins the femoral vein. The superjacent gland is lodged in the crural canal. Finally, the superior gland occupies the external part of the crural canal, and protrudes through the septum crurale into the pelvic cavity. It is continuous in the pelvis with the internal chain of external iliac glands. French authors generally call it the gland of Cloquet, while the Germans call it the gland of Rosenmüller.

PLATE I.







*Afferent vessels.*—The deep inguinal glands receive:—

(1) Some of the afferents from the superficial inguinal glands.

2. The deep lymphatics which accompany the superficial femoral vessels.

(3) The deep lymphatics which accompany the deep femoral vessels.

(4) The lymphatics from the glands in the male, and the clitoris in the female.

*Efferent vessels.*—The efferent vessels penetrate into the pelvic cavity and almost all terminate in the retro-crural internal gland. One or two may, however, end in the retro-crural external gland.

In filarial hydrocele the block in the lymphatics is in the region of the right and left juxta-aortic glands and may be caused by mature worms developing in the hilum of these glands, when there is the likelihood of microfilariæ being found in the hydrocele fluid. We have shown in a recent article (Acton and Rao, 1929) that the blockage may be produced by the immature worms in their passage through the glands producing fibrosis, or by setting up septic inflammation as the result of kataphylaxia. In either case the filariæ will not reach maturity, but will die in the tissue of the gland so that microfilariæ will not be found in the hydrocele fluid. This probably explains the very low microfilarial rate in the tapped fluid of these hydrocele cases. In Calcutta we have found only 2 per cent. of hydrocele cases to have microfilariæ in the hydrocele fluid, indicating that the majority of the hydroceles are produced by the lymphatic obstruction secondary to sepsis or irritation from the death of these immature worms in the glands. When chylocele is present the obstruction to the lymphatics must be in the pre-aortic glands, so that the flow of chyle from the intestines is prevented from entering the receptaculum chyli, and is dammed back through the juxta-aortic glands and so reaches the testicular lymphatics. Let us consider what happens when a radical cure is done for a hydrocele. The hydrocele sac is either excised or everted, whilst the lymphatic obstruction higher up in the juxta- or pre-aortic glands is not dealt with in any way. Consequently, lymph or chyle is now no longer collected in the closed sac, but is discharged into the loose cellular tissue in the scrotum around the testis.

The operation for hydrocele does not in any way affect the filarial block in the lymphatics higher up. The obstruction in the lymphatics of the testes still persists even after the radical operation for hydrocele, and as such the collection of lymph or chyle of the scrotum region has to find its way into the thoracic duct by a circuitous course through the inguinal glands. The inguinals have thus to take an extra load in addition to their normal drainage; a great deal of the fluid containing serum, microfilariæ,

and probably toxins, penetrates into the loose areolar tissue of the scrotum between the dartos muscle fibres. In time, irritation is produced and the inflammatory products obstruct the lymphatics coming down from the skin of the scrotum, with the result that congestion and progressive dilatation of the villous lymphatics of the scrotum is produced. Figs. A and B illustrate the manner in which normal skin lymphatics degenerate after this obstructive inflammation, resulting in the weakening of the lymphatic vessels and ending in permanent dilatation. This process is indeed very slow and our observations show that a state of high tension is produced in the distended vessels after the course of two to three years. The strength of these lymphatics has been so impaired that even the slightest irritation such as scratching results in rupture of the cyst and oozing of lymph or chyle as the case may be. Such lesions are very favourable for the onset of secondary infection from the skin. In addition to such secondary infection from outside is the possibility of infection from internal foci, the importance of which was discussed previously (Acton and Rao, 1929a). These secondary infections aggravate the pathological condition resulting in the manifestations described in the cases above, in the form of profuse discharges or periodic attacks of inflammation. Such secondary infections, either from the skin, or from internal foci, or from both, quicken the onset of the pathological condition known as lymph-scrotum, with profuse discharges or periodic attacks of inflammation.

#### SUMMARY.

1. Lymph-scrotum in India is a manifestation of filarial infection with *Filaria (Wuchereria) bancrofti*.
2. Nine cases of lymph-scrotum were studied. Each of these cases gave a history of a previous hydrocele operation.
3. It is presumed that the radical operation for hydrocele is responsible for the production of lymph-scrotum. Lymph-scrotum appears to be an artificial formation as the result of trauma.
4. The occurrence of lymph-scrotum is confined to cases of hydrocele due to filarial infection.

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## CARDIOVASCULAR MANIFESTATIONS OF EPIDEMIC DROPSY AND THEIR TREATMENT.

By R. N. CHOPRA, M.A., M.D. (Cantab.).

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DURING the latter half of last year a large number of cases of epidemic dropsy came under

our observation. The majority of these were admitted under one of us (R. N. C.) at the Carmichael Hospital for Tropical Diseases and some under the other (U. P. B.) at the Calcutta Medical College and Calcutta Medical School hospitals. In most of these cases cardiovascular derangements were the prominent feature. The cardiac aspect of cases admitted into the Tropical Diseases Hospital was jointly studied by both of us and in these, besides the usual critical physical examination, special methods of investigation such as orthodiagrams and electrocardiograms were employed.

In the following table we have given all the important findings regarding 19 of these cases.

A careful analysis of the symptomatology shows that the chief symptoms complained of by these patients were oedema of the legs, which appeared very early, and in some cases was followed by generalised anasarca, diarrhoea, fever,

TABLE.

No.	Name.	Age.	Sex.	Nationality.	Symptoms.	PHYSICAL SIGNS.				
						Heart.	Pulse.	BLOOD PRESSURE.		Pulse pressure.
								Systolic.	Diastolic.	
1	B. B.	45	Male	Hindu	Oedema both legs and palpitation 1½ months.	....	..	135	95	40
2	P. C. B.	9	"	"	Diarrhoea first, oedema 2 weeks later, fever in the evening for the last 3 days.	First sound short and sharp. Apex downwards and outwards. Systolic murmur at the apex.	..	118	70	48
3	P. C. B.	12	"	"	Palpitation, diarrhoea, oedema and fever.	....	..	115	75	40
4	S.	16	"	Mohammedan.	Diarrhoea, oedema ..	Systolic murmur at the apex and left base.	..	155 135 120	70 65 70	85 70 50
5	G.	16	"	Indian Christian.	Diarrhoea first, oedema 3 days later; occasional dull pain over præcordium.	Dilated outwards on the left side.	..	..	..	..
6	K. C. S.	21	"	Hindu	Diarrhoea first, then oedema, then diarrhoea subsided. Breathlessness on exertion.	Apex displaced slightly outwards on the left. Sounds muffled.	..	100	70	30
7	S. K. D.	17	"	"	Oedema and palpitation.	....	80	125	65	60
8	Y. A.	16	"	Mohammedan.	Palpitation and diarrhoea first, then oedema.	Apex displaced outwards on the left. Systolic murmur at the apex.	80	116	65	51
9	B. K. R.	14	"	Hindu	Oedema, palpitation, diarrhoea, fever.	Sounds accentuated ..	..	90	70	20
10	R. D.	30	Female	"	Blood and mucus in stools, oedema, fever, palpitation, breathlessness at night.	Enlarged outwards on both sides. Sounds muffled. Mitral and tricuspid regurgitation.	100	115	85	30
11	B. S.	22	Male	"	Diarrhoea and oedema first, then breathlessness and orthopnoea.	Apex slightly displaced outwards on the left. Pre-systolic murmur over the mitral area.	112	105	70	35
12	R. N. B.	21	"	Mohammedan.	Oedema and palpitation.	Pulmonary systolic murmur.	100	116	65	51

TABLE—concl'd.

No.	Name.	Age.	Sex.	Nationality.	Symptoms.	PHYSICAL SIGNS.				
						Heart.	Pulse.	BLOOD PRESSURE.		Pulse pressure.
								Systolic.	Diastolic.	
13	U. R.	6	Female	Hindu	Diarrhœa, œdema and cough.	Cardiac dullness increased on the left side. Pre-systolic murmur over the mitral area.	98	90	65	25
14	K.	14	Male	Mohammedan.	œdema and fever ..	Apex at the normal position. Pre-systolic murmur over the mitral area.	110	120	65	55
15	M.	27	Female	Hindu	œdema, diarrhœa, palpitation, præcordial pain, dry cough.	Systolic murmur at the apex.	84	110	75	35
16	B.K.C.	28	Male	"	œdema, breathlessness and palpitation.	Dullness increased on the right side. Rhonchi and râles all over the chest.	..	105	70	35
17	K.B.D.	14	Female	"	œdema, breathlessness.	Dullness increased outwards on the left side. Systolic murmur over the mitral and pulmonary areas.	..	90	50	40
18	S.K.M.	17	Male	"	œdema first legs, then whole body. Fever and breathlessness.	Apex beat displaced one inch outwards. Cardiac dullness increased outwards on the left side. Systolic murmur at the apex.	132	115	75	40
19	N.K.N.	14	"	"	Generalised anasarca, orthopnœa and cough.	Apex in normal position. First sound short and sharp.	128	140	75	65

shortness of breath, palpitation, præcordial pain and in advanced cases orthopnœa, cardiac asthma and cough. Before discussing these symptoms in detail a few words may be said regarding the incidence of age, sex and nationality in these cases. A perusal of the table shows that the age of the patients varied between 6 and 45 years, the highest incidence being between 12 and 17 years, and 18 out of the 19 cases were below the age of 30. So far as sex and nationality are concerned, 15 of our cases were males and 4 females; 14 were Hindus, 4 Mahomedans and 1 an Indian Christian.

#### SUBJECTIVE SYMPTOMS.

(1) *œdema of the legs* is one of the very early symptoms in a large number of cases. This is due to capillary dilatation giving rise to increased transudation of fluid into the tissues. This view is supported by *post-mortem* findings. Wide dilatation of the subcutaneous vessels, sometimes angiomatous formations, are frequently met with. According to Acton and Chopra (1927) sections of the skin show increased vascularity in the subpapillary vascular plexus. The vessels are easily seen and round them there is an exudation of lymphocytes and endothelial cells. Side by side with this vascularity, there is œdema which separates the white and elastic fibres of the corium. The

striking point about the sections is the enormous increase in the vascularity of the subcutaneous fatty tissue; the vessels here are enormously dilated and in parts the sections remind one of nævoid tissue. In later stages of the disease increased vascularity and transudation are aggravated by the inefficient working of the heart and anæmia.

(2) *Diarrhœa*.—Patients suffering from epidemic dropsy generally pass a large number of diarrhœic stools, especially in the beginning, in fact in one epidemic studied by the senior author, diarrhœa was the most prominent symptom in almost every case that was admitted. This condition is due to congestion of the intestinal mucous membrane brought about by dilatation of the blood vessels. The submucous tissues become thickened and in severe cases *post-mortem* examination revealed ecchymosis. It has been shown that practically all the abdominal organs such as the liver, spleen, kidneys, etc., show a greater or lesser degree of congestive changes. Our conclusions are in accord with Acton and Chopra who hold that the diarrhœa produced is due to the action of the toxic bases, which not only produce œdema of the mucous membrane but also exfoliation of the epithelium. These workers have shown that the stools of patients suffering from the disease show a large number of Gram positive

latter condition have been studied by Wenkebach (1928). According to him the whole of the heart is enlarged from the very beginning, as is clearly shown by skiagrams. The failure may occur suddenly or less rapidly, and chiefly involves the right heart, so that the apex beat disappears, and the patient is conscious of curious wriggling movements of the heart muscle. Increasing venous stasis occurs in the liver and vena cava, a large tender pulsating organ can be felt, and ascites is present. The electrocardiograph shows slight exaggeration of the different waves, and a preponderance of the right ventricle. The pulmonary circulation in beriberi is free from stasis, and œdema of lungs only comes on shortly before death. There is nothing in the lungs to suggest the reason for the right heart failure. An increasing insufficiency occurs of the whole heart, the right heart is doomed before to suffer much more than the left, and even to suffer at the profit of the other. The left heart cannot receive more blood than the right heart can give it. The left heart is small and poorly filled, and a small rapid fairly palpable pulse gives proof of the relative competence of the left ventricle. Later it gradually loses its systolic power also. This difference in the condition of the heart in the two conditions is probably due to the fact that the processes which give rise to them are different. The general clinical picture met with in epidemic dropsy is quite different from that met with in beriberi.

*Treatment.*—The patients were kept strictly in bed and were given a liberal protein diet. Rice was entirely cut out of the dietary, wheat bread or chapaties being substituted. To control diarrhœa, we gave tinc. ferri perchlor. 15 to 30 minims three times a day with a little glycerine, a little liq. strychninæ hydrochlor. being added when weakness of the heart was observed. Apart from its astringent action on the gut it also acted on the hæmopoietic system and stimulated blood formation.

In the cases where the heart was involved and there was decompensation we tried a number of drugs. Digitalis was tried but gave very unsatisfactory results; in fact in some cases it made the patient worse. Calcium lactate by the mouth and injections of calcium chloride were no better. Injection of small doses of adrenaline, such as 3 or 4 minims, gave only temporary relief in some cases and ephedrine by itself fared no better. A sensitiveness to adrenaline was produced after it was given for a few days consecutively, palpitation and oppression in the chest being the chief symptoms observed after injection.

The drug which was most effective in controlling the heart symptoms was the tincture of ephedra, prepared from an Indian species of *Ephedra*—*E. vulgaris* Rich (*E. gerardiana*, Wall.)—first introduced and used by one of us

(R. N. C.). We have both independently verified its efficacy in the left heart failure in epidemic dropsy as well as in other cases of cardiac decompensation. The Indian varieties of *Ephedra* contain larger quantities of pseudo-ephedrine and comparatively less ephedrine, as compared with the Chinese varieties. The vasopressor effect is stronger in the case of ephedrine, which acts almost entirely on the vasomotor nerve-endings, while pseudo-ephedrine has been shown to have some stimulant action on the musculature of the arteries, and a powerful stimulant action on the myocardium. It is this stimulation of the myocardium by pseudo-ephedrine, and the stimulation of the accelerator mechanism by ephedrine which makes tincture of Indian *Ephedra* a very valuable remedy when the heart is failing.

Digitalis, as we have pointed out, is not only ineffective but may be distinctly harmful, especially in the early stages. It can, however, be prescribed when there is right heart failure, but such cases, as we have already pointed out, are not very frequent. Since Levy has conclusively shown that the effect of adrenaline may be multiplied 200—300 per cent. if thyroid is present, in some cases where there were signs of thyroid deficiency we give 1 gr. of thyroid extract 2 or 3 times a day. When œdema of the lungs sets in, it is better to perform venesection and let out 10 to 12 ounces of blood, so as to relieve the overloaded right heart and stagnant pulmonary circulation. By this treatment we did not lose any case in the series described in the table, though the mortality in the cardiac type of epidemic dropsy is fairly high.

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#### THE USE OF A SNARE IN ENUCLEATION OF THE EYEBALL.

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 LIEUTENANT-COLONEL, I.M.S.,

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In performing enucleation of the eyeball in cases where it is considered advisable to place a glass or metal globe, cartilage fat, etc., inside the muscle cone, it is desirable to have as dry and clean an exposure of Tenon's capsule as possible. Even in simple enucleation where no

attempt is made to form a movable stump, it is as well to have a minimum of bleeding and thus eliminate post-operative reaction.

Some years ago in order to achieve this end, I designed a double curved clamp rather like a Spencer Wells' clip forceps bent close behind the jaws and again half-way up the shaft, which Messrs. Down Brothers manufactured. This was used to clamp the optico-ciliary pedicle before it was severed with scissors. I think perhaps the use of an Eves' tonsil snare (by Meyrowitz) is a slight improvement on this, as it is easier to place in position,—an important point when using local anæsthesia,—and one is more certain of gripping the various structures of the pedicle in their entirety. It is desirable when intending to insert an artificial globe or other implant to pick up the recti either on ligatures or with suitable clamps before they are divided. When the various muscle insertions have been severed and the globe has been cleanly separated from Tenon's capsule back to the zone of the short ciliary vessels, Trelat's enucleation spatula is inserted and keyed on to the pedicle. With gentle backward pushing movements the optic nerve and the various ciliary vessels and nerves are stripped and defined for a short distance from the globe. Then with the Trelat's enucleation spatula still in position but pushed gently backwards, the snare wire, arranged to a suitably sized loop is threaded over the globe and gradually tightened as it approaches the posterior aspect of the globe. Here it is tightened snugly into position close behind the globe and in front of the spatula. The wire is slowly and firmly tightened, held like this for a short time, and then sufficient force is applied to cut through the optic nerve, ciliary vessels, etc. The globe shoots forward on being freed, and when it is removed one gets a good demonstration of the bag formed by the deep layer of Tenon's capsule, held open by the clamps on the four recti. There is a hole in its posterior part through which orbital fat is seen, but through which it is not inclined to herniate to any extent if the procedure has been carefully performed. This bag is for all practical purposes surgically dry. The operator may, if he so desires, close the posterior hole with catgut; ordinarily this is unnecessary. The procedure of choice is then adopted with regard to an artificial globe. It is as well when the globe is placed in this capsule bag, to include Tenon's capsule as well as the muscles in the purse string catgut suture, by picking up a bit of the fascial bag between each muscle, as well as the muscles themselves. This holds the globe snugly in position and prevents it threatening to escape laterally between two muscles. The conjunctiva is closed by careful apposition of the mucous membrane with a continuous horizontal silk suture. There is a minimum of reaction.

## A NOTE ON THE MICROSCOPICAL EXAMINATION OF FÆCES.

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WHEN I took over charge of the District Laboratory early in January 1929 I found that one of my duties was to examine all menials who had anything to do with the handling of food, with a view to determining whether they were carriers of the enteric or dysentery group of diseases. In this paper I propose to deal only with the microscopical examination of fæces in such menials. In the first four months the results I was getting were not very satisfactory, as the method employed was the usual one of examining an iodine and saline emulsion. From May 1929 I decided to adopt some method of concentration of fæces and started trying out Yorke and Adams' method of concentration. These workers had used this method for the concentration of *Entamœba histolytica* cysts. Briefly the method consisted in making an emulsion of a fairly large quantity of fæces in a large quantity of water. After 15 minutes the scum was removed from the top and the liquid part removed into another glass cylinder and kept for 24 hours. The deposit was then centrifuged and washed two or three times and examined. This method I found, not only concentrated the protozoal cysts but also ova of helminths, and I determined to put it to the test: 50 cases were examined by me both by the ordinary method and the concentration method and the results were as under:—

	Ordinary method.	Concentration method.
Cysts of <i>Entamœba histolytica</i> ..	5	7
Cysts of <i>Entamœba coli</i> ..	21	34
Cysts of <i>Endolimax nana</i> ..	2	3
Cysts of <i>Iodamœba butschlii</i> ..	9	12
Ova of <i>Tœniide</i> ..	1	2
Ova of <i>Hymenolepis</i> ..	1	3
Ova of <i>Ascaris lumbricoides</i> ..	1	2
Ova of Hookworm ..	3	6
Ova of <i>Enterobius vermicularis</i> ..	0	2
Ova of <i>Trichuris trichiura</i> ..	1	2

From these results it was obvious that the method of concentration was much better than the ordinary method. As a matter of fact the figures given do not adequately emphasise the advantages of this method as, in cases where cysts or ova were present in both methods, in the concentration method they were present in large numbers and consequently were not liable to be missed. Also in this method a good deal of the debris had been previously disposed of so that the examination was very much simplified. Another advantage of this method was that it needed no special apparatus and it cost nothing. The latter point is of great importance in military laboratories as the officers in charge have fixed allotments annually, which they are trying not to exceed.



This method then was adopted by me for some time until I read of another concentration method, viz., that of De Riva's (*Amer. Journ. Trop. Med.*, 1928, Jan., Vol. 8, No. 1, pp. 63—72). Briefly this method consists in emulsifying faeces in an excess of 5 per cent. solution of acetic acid. The supernatant homogenous suspension is mixed with an equal quantity of ether and centrifuged. The mixture separates into four layers with the ethereal extract on top, next the detritus, then the acetic acid, and finally a little sediment at the bottom. The sediment is supposed to contain all the cysts and ova. Fifty cases were examined by both these methods of concentration and the results were as under:—

	De Riva's method.	Yorke and Adams' method.
Cysts of <i>Entamoeba histolytica</i>	2	7
Cysts of <i>Entamoeba coli</i> ..	21	30
Cysts of <i>Endolimax nana</i> ..	1	5
Cysts of <i>Iodamoeba butschlii</i> ..	3	9
Cysts of <i>Giardia intestinalis</i> ..	2	2
Ova of <i>Tæniidæ</i> ..	0	1
Ova of <i>Ascaris lumbricoides</i> ..	0	1
Ova of <i>Hymenolepis</i> ..	1	2
Ova of Hookworm ..	5	5
Ova of <i>Enterobius vermicularis</i>	0	1

I was of opinion therefore that the method of Yorke and Adams is superior to De Riva's method. Also in De Riva's method the cysts do not appear to be as clear as with the other method, and the chromatoid bars in *Entamoeba histolytica* cysts do not stand out to the same extent. Another disadvantage is that it is a costly method as large quantities of ether have to be used.

During the year 1929-30 I have personally examined the faeces of 1,000 cases with the method of concentration of Yorke and Adams and the results are shown below.

	Number positive.	Percentage positive.
Cysts of <i>Entamoeba histolytica</i>	134	13.4
Cysts of <i>Entamoeba coli</i> ..	507	50.7
Cysts of <i>Endolimax nana</i> ..	131	13.1
Cysts of <i>Iodamoeba butschlii</i>	150	15.0
Cysts of <i>Giardia intestinalis</i> ..	51	5.1
Cysts of <i>Chilomastix mesnili</i> ..	3	0.3
Ova of <i>Tæniidæ</i> ..	12	1.2
Ova of <i>Hymenolepis</i> ..	23	2.3
Ova of <i>Ascaris lumbricoides</i>	27	2.7
Ova of Hookworm ..	218	21.8
Ova of <i>Enterobius vermicularis</i>	8	0.8
Ova of <i>Trichuris trichiura</i>	33	3.3

The above figures appear sufficiently striking to justify other workers in trying out this method with a view to confirmation or otherwise.

My thanks are due to the Director of Medical Services in India for allowing me to publish this paper.

## THE INCIDENCE OF SPRUE AMONGST INDIANS.

By R. RAMANUJAYYA, L.M.P.,  
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My object in sending this note to the press is to lend support to the observation that sprue is a common disease in some parts of India—so common as to deserve the name of an epidemic. It affects the natives of the place in which the disease is endemic. It does not appear to show any special predilection for strangers, Indians or Europeans, who come to live in the area affected.

The area I refer to is a bit of country lying between two rivers with my headquarters as the centre. The country is fertile at both ends, being fed by rivers. But the affected area is arid, the climate is hot and dry, and the soil consists mainly of conker and to a less extent of black clay and red earth. It is fed by rain and the people draw their water supply almost exclusively from rain-fed tanks open to foul contamination. The people are Hindus, poor, and generally constipated. They are non-vegetarians, but they eat little meat and not much vegetables, living mainly on the cereals they grow in their fields.

The disease presents the three cardinal signs, viz., flatulent diarrhoea, glazed tongue with superficial erosions, and anæmia.

It is very insidious in its onset, lasts for months with periods of comparative ease and gradually makes the person a physical wreck. It affects men in their prime. My youngest patient was 22 years and my oldest 55. So far I have seen only one woman affected, but I cannot offer this as a proof that it is rare in the female sex. I have not been able to get a history of dysentery—bacillary or amœbic—in the few cases that came under my notice.

The patient complains (to start with) of a certain feeling of aversion for food. He gradually loses his appetite. There is flatulence in his abdomen and diarrhoea sets in. His tongue begins to smart from spicy food. There is constant accumulation of viscid saliva in his mouth. He wastes and the emaciation in some cases is so marked that he is nothing but a walking skeleton. The disease either gets spontaneously cured or disappears for months and then recurs. I have not come across a death so far.

On physical examination of a typical case, one finds that the patient is of a muddy yellow hue. The mucous membranes are all bleached. The conjunctiva is deadly pale. The tongue, cheek and pharynx are pale with, sometimes, here and there an injected vessel showing up pink.

The tongue is flabby or thin, is not coated and is polished with fissures about it. The papillæ are not visible. There are superficial erosions over the tongue, buccal mucous membrane, fauces and pharynx, which make it an

agony for the patient to swallow any food with even a trace of pungency about it. In one case I saw peptic ulcers. In another patches of hypertrophied papillæ intervening between smooth glazed areas over the tongue. The heart sounds are normal. The abdomen presents a normal appearance. It is not scaphoid as one would expect it to be considering the diarrhoea and general emaciation. There is tenderness on deep pressure all over the abdomen. Gas can be displaced by the fingers, especially in the right lower quadrant.

The motions are five or six in a day, semi-solid and generally said to be ash coloured. They may be yellowish. In one case they were greenish. Whether this was due or not to the bismuth I was administering to him, I have my doubts. The stool is sometimes liquid, containing undigested and partially digested rice. It contains mucus in some cases, but no patient complained that he passed blood. One patient had no diarrhoea at all.

I met with some success with the line of treatment detailed below. The patient is put to bed and takes complete rest. He is placed on milk diet. On the second day, the bowels are washed out with an enema. Then a pint of water with 10 to 30 grains of silver nitrate is introduced and the patient is asked to retain it as long as he can. Diarrhoea improves very much after this. In my early cases I used to give bismuth carbonate in 30 grs. doses three times a day. When diarrhoea ceases I used to give the patients stomachics. Later, I began giving tincture of catechu and pulvis creta aromaticus for the diarrhoea, and an acid stomachic mixture to revive appetite. After reading the article by Major Hance, I.M.S., on sprue in the *Gazette* for March 1930, I give nothing but the acid mixture. I have found the patient's response to be very good. For the mouth I find a combination of alum and catechu in a gargle to be useful.

The following are illustrative cases:—

*Case 1.*—Hindu female, aged 28, with two children, a resident of a place 18 miles from here. Skin of a lemon yellow colour, mucous membranes very pale. She was merely a bag of bones. She complained of frequent, copious, watery flatulent diarrhoea. Temperature 102°F. in the evening. Dry troublesome cough. Tongue pale, glazed, with fissures about it—smarting while taking even the most insipid diet. In spite of my best endeavours to incriminate the lungs I could find nothing suspicious about them.

*Case 2.*—Hindu male, aged 38, native of Ariyalur. Typical case of sprue. Duration 12 months. Very weak and emaciated—confined to bed for 3 months—no history of dysentery; besides other troubles, he complained of a burning sensation all over the body. Treated with milk diet—silver nitrate per rectum—bismuth and stomachic mixture orally. It is 3 months since he left my hands and I hear that he is still well.

*Case 3.*—Hindu, male, aged 55, native of Ariyalur. Complaint—frequent unformed stools, greenish in colour, lack of appetite, flatulency and a sprue tongue. No history of dysentery. Duration 3 months. Patient not much emaciated. Teeth loose and gums with pyorrhœa. Tenderness all over the abdomen on deep pressure.

Liver dullness extends up to lower border of 3rd rib in the mid-clavicular line. Treatment: rest, milk diet, rectal infusion of silver nitrate solution, emetine hypodermically, bismuth by the mouth, and a catechu and alum gargle. The patient was very intolerant to bismuth and he developed troublesome hiccough after taking it. So bismuth was abandoned and 20 grs. doses of pulvis creta aromaticus and sodium bicarbonate were given instead. After two days his appetite became completely lost. This suggested to me that I was aggravating a condition of achlorhydria. With a great deal of hesitation, I gave him an acid mixture. His response was very good and for the past month the patient has been well.

*Case 4.*—Male, aged 38, native of Ariyalur. History of repeated filarial attacks and no history of dysentery. Duration of present complaint—6 months. Lack of appetite, anæmia, and a sprue tongue. No diarrhoea, but constipation. Tenderness all over the abdomen: has external and internal piles. He is on the acid mixture. His appetite has revived, but his tongue prevents ingestion of food. This is a patient whose diet it is very difficult to control.

*Case 5.*—Hindu male, aged 22, resident of Ariyalur. Had a similar attack 3 years ago. It started at Yercaud, a cold hilly station, where he went with a former European resident of Ariyalur. He suffered from it for 6 months and it was then spontaneously cured. The present attack is of about 6 months' duration. The patient is skin and bones, of a pale muddy colour with very pale conjunctivæ and a sprue tongue. No history of dysentery. Lungs—right apex is suspicious. No cough. No fever. Tenderness all over the abdomen on deep pressure. Frequent loose motions, sometimes containing undigested rice, flatulency, lack of appetite. Treated solely with acid mixture and iron tonics. Motions stopped and general condition improving.

I have endeavoured to give in the above lines certain salient features of the few cases I treated. In addition to these, I have seen many persons in these parts who are suffering from typical sprue.

#### Conclusions.

1. Sprue is a common disease of Indians in the affected areas.
2. The water supply, climate and poverty seem to be factors of great ætiological importance.

My thanks are due to Dr. C. E. R. Norman, Chief Medical Officer, South Indian Railway, for giving me permission to publish these notes.

#### NOVASUROL IN THE TREATMENT OF ASCITES.

By C. S. SHARMA, L.M.P.,

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In the *Indian Medical Gazette* for April 1929, p. 229, I read an abstract of a paper by Sir John Broadbent, M.D., on the treatment of ascites by Novasurol and ammonium chloride, and decided to try the treatment myself on cases of ascites and general dropsy. The former drug is stated to be a double salt of sodium mercuric-chlor-phenyl-oxyacetate, with 1/20th grain of veronal (di-ethyl barbituric acid) in 1 c.c.; it is put up in ampoules; and contains 33.9 per cent. of mercury. It does not belong to the novarsenobenzol, novarsenobillon group

of products, despite the similarity of its name. It may be given in doses up to 2 c.c. intramuscularly at intervals of 3 to 7 days; it is soluble in water, and may be given either intramuscularly or intravenously. The patient's tolerance to it should first be tested by giving 0.5 c.c. intramuscularly. In addition, ammonium chloride is given by the mouth in divided doses, up to grs. 150 in the 24 hours. Sir John Broadbent states that "1 c.c. of Novasurol, followed by grs. 120 of ammonium chloride, daily was efficacious in producing marked diuresis." In my own cases I have not given such large doses of ammonium chloride, but instead a diuretic mixture containing grs. x of ammonium chloride, tincture of digitalis, hyoscyamus, buchu, and extract of purnarnava, after injections of 1 c.c. of Novasurol. The treatment of ascites by repeated tapping or ordinary diuretics is admittedly unsatisfactory, but under the influence of Novasurol oedema begins to disappear as if by magic after the first two or three injections.

The reason for the successful treatment of ascites and oedema by Novasurol and ammonium chloride is not clear. Dr. George Curtis is of opinion that "under the influence of the specific diuretics, permeability changes are effected in the tissues, resulting in the rapid passage of electrolytes, especially chlorides, into the blood stream from the tissues. These stimulate the kidneys and pass into the urine in large amounts. When diuresis does not occur, the marked increase in chloride secretion does not take place."

Cases of renal dropsy in which albumin is present do not appear to respond as favourably to treatment as those due to hepatic cirrhosis, as far as my study of the subject goes.

The following are illustrative cases:—

*Case 1.*—Hindu male adult, with enlargement of the liver, ascites, and general anasarca. No albumin in the urine.

29-11-29. Given  $\frac{3}{4}$  c.c. Novasurol intramuscularly into the left deltoid; followed by ammonium chloride grs. 20 in a diuretic mixture every 4 hours for 6 doses. There was free passage of urine during the first 24 hours after the injection.

1-12-29. One c.c. Novasurol intramuscularly.

4-12-29. One c.c. Novasurol intramuscularly. Oedema over the face and extremities is much less.

7-12-29. Half a c.c. of Novasurol intramuscularly.

11-1-30. One c.c. Novasurol intramuscularly. The patient, who had formerly been bed-ridden, now began to walk about unaided, and indulged in all sorts of foods and condiments. As a result the condition relapsed and he died.

*Case 2.*—Mahomedan male child, aged 14, with ascites due to chronic malaria, with enlargement of the liver and spleen. Urine specific gravity 1010, no albumin.

22-12-29. Half a c.c. Novasurol intramuscularly.

26-12-29. One c.c. Novasurol intramuscularly.

1-1-30. One c.c. Novasurol intramuscularly.

5-1-30. One c.c. Novasurol intramuscularly. Abdomen much smaller, blue distended veins less distended.

9-1-30. One c.c. Novasurol intramuscularly.

13-1-30. One c.c. Novasurol intramuscularly. Abdomen receding further; process good.

19-1-30. One c.c. Novasurol intramuscularly. The peritoneal cavity now contains very little fluid.

23-1-30. One c.c. Novasurol intramuscularly.

27-1-30. One c.c. Novasurol intramuscularly.

31-1-30. One c.c. Novasurol intramuscularly.

6-2-30. One c.c. Novasurol intramuscularly. Improvement continues, but the liver is still enlarged.

13-2-30. Injection of 1 c.c. iron arsenite and strychnine, as the patient is very emaciated and anemic.

After this preliminary improvement, the patient discontinued treatment. Later, the fluid re-accumulated. In this case at one time I thought of tapping the abdomen, but the marked improvement and rapid loss of fluid under Novasurol treatment rendered this unnecessary.

*Case 3.*—Mahomedan male, aged 18, with ascites probably due to cirrhosis of the liver; no albumin in the urine. He was given 9 injections of Novasurol, 1 c.c. each, at intervals of 4 to 7 days during December 1929 and January 1930, and was completely cured. The condition has not relapsed up to May 1930, the time of writing. I thought of tapping the abdomen, but no necessity to do so remained after the injections.

*Case 4.*—Hindu male, with ascites and general anasarca; urine of specific gravity 1025, no albumin.

13-1-30. One c.c. Novasurol intramuscularly.

17-1-30. One c.c. Novasurol intramuscularly. Marked diuresis followed this second injection, and the oedema was markedly reduced; but the patient unfortunately now left off treatment.

*Case 5.*—Hindu male, adult; apparently a hopeless case with ascites and general anasarca, the abdomen being greatly distended. He insisted on being tapped, which gave him temporary relief. There was no albumin in the urine, but it contained much phosphates. The liver and spleen were enlarged. He remained in hospital for a month and was given 6 injections of Novasurol with the result that all oedema and abdominal fluid disappeared; he was discharged cured and able to walk. Is still attending the hospital for treatment of the enlarged liver.

*Case 6.*—Hindu male adult, pauper patient, with ascites; the urine is of specific gravity 1025, with no albumin. Has received two injections and is making good progress.

To sum up, the results obtained by injections of Novasurol in cases of ascites due to portal congestion appear to be very encouraging and far superior to any other medicinal treatment, at least in relieving oedema and ascites; but whether the results are permanent or not, one cannot say at present. The following appear to be the chief indications and contra-indications for this line of treatment:—

*Indications.*—In all conditions of cardiac engorgement, whatever their causation, such as valvular disease, disease of the cardiac muscle, acute and chronic affections of the heart, functional incompetence, mechanical and inflammatory engorgement, effusions into serous cavities, oedema in nephritis and nephrosclerosis, ascites due to cirrhosis of the liver, uræmia, etc.

*Contra-indications.*—In acute glomerulonephritis and enteritis.

In conclusion, my thanks are due to Dr. Prahlad Narain, L.M.S., Civil Surgeon, Fategarh, for permission to publish the notes on the above cases.

# REPORT ON AN INVESTIGATION OF BERIBERI AT GUNTUR.

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and

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THE problem of beriberi has been investigated by different authors in different countries. Our apology for publishing our results is that this district is one of the most affected districts in the Madras Presidency and that we had ample opportunity of investigating more than a hundred cases during the year 1929-30.

We place before the readers the main conclusions in brief, so that they will be able to follow our line of argument.

TABLE II.

Population distribution according to caste and nationality.

			1921 census figures.
Hindus	..	..	1,515,986
Muhammadans	..	..	130,718
Christians	..	..	153,510
Other castes	..	..	9,360

At a glance at the table it would appear that there is a greater incidence of the disease amongst the Hindus, but taking the population into consideration, the relative incidence of the disease in the Hindu community is far less than in other communities.

TABLE III.

Distribution according to social condition.  
(Married or Single.)

	1926.		1927.		1928.		1929.		Total.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
Married ..	82	29	86	53	83	38	62	25	313	145
Single ..	10	1	6	1	7	3	3	1	26	6
TOTAL ..	92	30	92	54	90	41	65	26	339	151
Total married .. .. 458										
Total single .. .. 32										
TOTAL .. 490										
Deaths										
1926. 1927. 1928. 1929. Total.										
.. 6 9 8 6 29										

1. Beriberi is a definite disease by itself, clinically.

2. It is a disease due to deficiency of vitamin B plus an infection.

3. The disease is completely curable in the earlier stages if properly treated.

Epidemiology has been worked out from the cases admitted to this hospital in 1926, 1927, 1928 and 1929.

TABLE I.

Distribution according to caste and nationality.

	1926.	1927.	1928.	1929.	Total.
Hindus ..	54	86	76	47	263
Muhammadans ..	37	20	23	12	92
Christians ..	16	20	21	21	78
Other castes ..	15	20	11	11	57
TOTAL ..	122	146	131	91	490

We always label the case as one of beriberi only on the presence of the essential symptoms; hence, the decrease in the number of cases in 1929 when compared with the previous years.

Married people are affected more than single. It is obvious that the married man has to support his wife and children with the limited income he gets.

GRAPH 1.

Distribution according to age and sex.

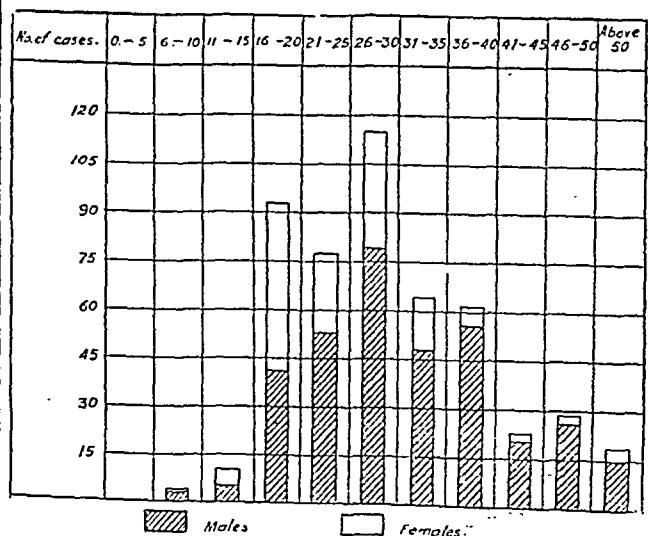


TABLE IV.  
Distribution according to age and sex.

	1926.		1927.		1928.		1929.		TOTAL.		Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
0—5 ..	0	0	0	0	0	0	0	0	0	0	0
6—10 ..	0	0	1	0	0	1	1	0	2	1	3
11—15 ..	1	3	1	1	2	1	1	0	5	5	10
16—20 ..	13	13	13	17	9	10	5	10	40	50	90
21—25 ..	14	6	12	6	10	12	14	4	50	28	78
26—30 ..	17	5	28	13	21	8	15	8	81	34	115
31—35 ..	15	2	6	8	13	5	13	2	47	17	64
36—40 ..	16	1	12	5	15	1	10	1	53	8	61
41—45 ..	7	0	6	1	5	0	3	1	21	2	23
46—50 ..	7	0	6	1	11	2	2	0	26	3	29
Above 50 ..	2	0	7	2	4	1	1	0	14	3	17
TOTAL ..	92	30	92	54	90	41	65	26	339	151	490

Maximum age .. .. 70  
Minimum age .. .. 6

The highest incidence of disease is between the ages of 16 and 40.

The minimum age is important for the fact that the disease is not seen among children and infants. Infantile beriberi is not seen in this district.

The maximum incidence of the disease among females also corresponds to that period in the male but to a lesser extent. But after 40, very few cases are seen in females.

TABLE V.

Distribution according to occupation.

	1926.	1927.	1928.	1929.	Total.
Lawyers ..	..	..	1	..	1
Income-tax officer ..	..	..	..	1	1
Police constables ..	27	28	28	18	101
Students ..	4	2	4	1	11
Ryots ..	1	3	4	1	9
Petty traders ..	1	1	..	..	2
Teachers ..	2	2	1	1	6
Carpenters ..	1	2	..	..	3
Goldsmiths ..	1	1	1	..	3
Silversmiths ..	1	..	..	..	1
Dhobies ..	1	..	..	..	1
Cobblers ..	1	..	..	2	3
Shepherds ..	1	..	..	..	1
Peons ..	2	..	..	..	2
Jutka drivers ..	1	..	..	..	1
Tailors ..	1	..	..	..	1
Motor drivers ..	..	1	..	..	1
Barbers ..	..	1	..	..	1
Potters ..	..	2	..	..	2
Ward attendants ..	..	1	..	..	1
Clerks ..	..	..	..	..	..
Blacksmiths ..	..	..	2	..	2
Weavers ..	..	..	..	2	2
Stove-repairer ..	..	..	1	..	1
Labourers ..	77	102	89	65	333
TOTAL ..	122	146	131	91	490

The largest number of cases are seen among the labourers. As seen from the above table it is evident that it is mainly a poor man's disease.

*Police constables.*—All the police constables in this district have to come to this hospital for treatment. This clearly explains the large number of cases among them. It is only among them we have seen the earliest stages of the disease, i.e., the larval stage of beriberi.

From the following table and graph it will be seen that the greatest incidence of beriberi is between June and October.

The curve of rainfall is also shown in the same graph to show the exact correlation between rainfall and the incidence of beriberi.

This graph requires a special comment because it brings out some most important facts.

1. The largest number of cases come on just at the end of the hot weather when the majority of the labourers have no work.

2. This coincides also with the onset of the rainy weather, which to our mind precipitates an attack of beriberi by an infection in an individual whose condition is below par.

3. The largest number of cases are seen during the rainy weather.

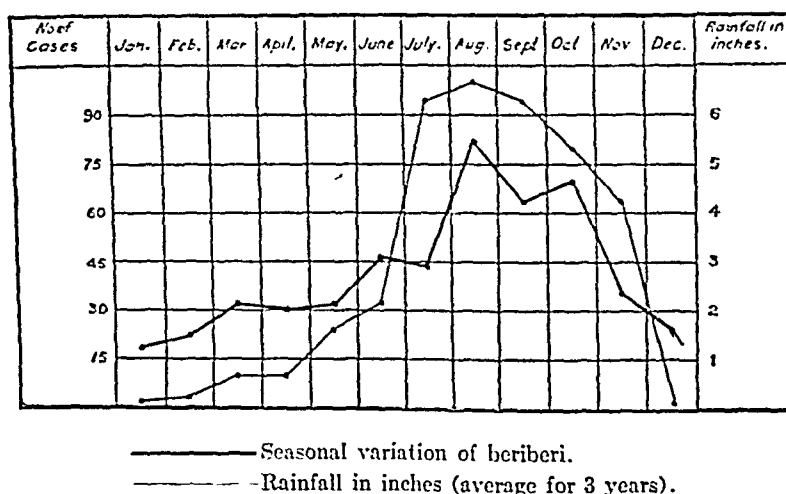
#### Geographical distribution.

We are concerned only with the Madras Presidency and Guntur District in particular. Col. McCarrison in his memoir shows that the distribution of beriberi in the Madras Presidency is restricted to the coastline districts of Ganjam, Vizagapatam, Godavary, Kistna, Guntur and Nellore.

TABLE VI.  
Seasonal variation of beriberi.

	1926.		1927.		1928.		1929.		Total.		Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
January ..	2	2	1	0	5	2	2	1	13	5	18
February ..	5	2	5	2	3	1	1	2	14	7	21
March ..	6	2	3	3	8	2	5	3	22	10	32
April ..	6	1	8	3	5	4	2	1	21	9	30
May ..	7	3	5	2	8	1	4	2	24	8	32
June ..	1	0	11	12	12	4	3	0	30	16	46
July ..	9	1	5	1	10	2	7	5	31	12	43
August ..	17	6	13	7	12	8	13	4	55	25	80
September ..	14	6	10	5	8	5	9	4	41	20	61
October ..	9	4	18	3	12	7	11	4	50	18	68
November ..	9	0	6	7	4	3	6	0	25	10	35
December ..	4	3	4	6	3	2	2	0	13	11	24
TOTAL ..	92	30	92	51	90	41	65	26	339	151	490

GRAPH 2.



— Seasonal variation of beriberi.  
 - - - Rainfall in inches (average for 3 years).

The following table shows the number of rice factories in Guntur District, in relation with beriberi.

TABLE VII.  
Rice factories in Guntur District.

	No. of rice factories.	No. of cases of beriberi.
Guntur Taluk ..	17	347
Tenali Taluk ..	17	200
Bapatla Taluk ..	10	144
Repalle Taluk ..	5	41
Ongole Taluk ..	2	41
Narsaraopet Taluk ..	1	49
Sattenapalle Taluk ..	..	35
Vinukonda Taluk ..	..	17
Palnad Taluk ..	..	10

The following maps of Guntur District show the relationship between the incidence of beriberi and the consumption of rice.

### Pathology.

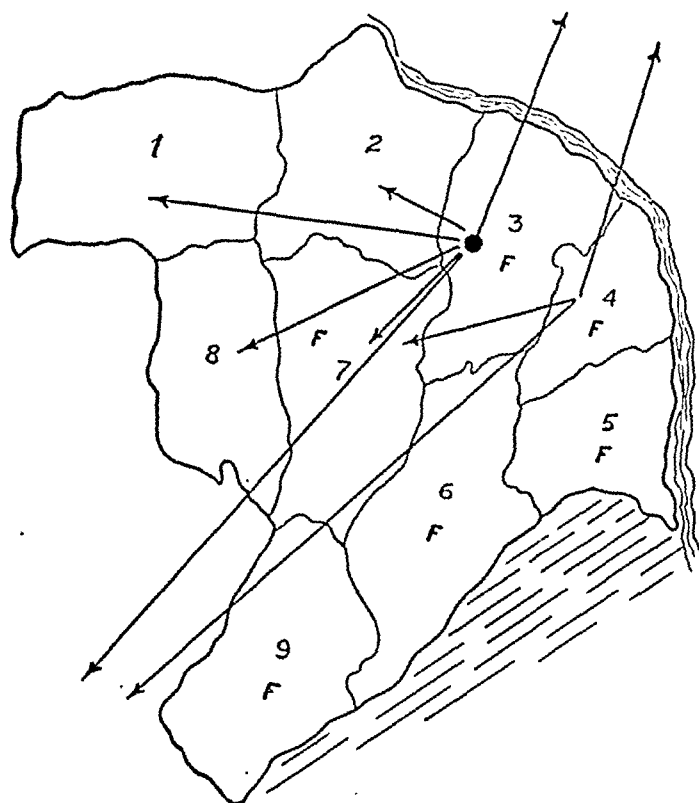
Our experience is limited to post-mortem examinations on four cases that died of the acute pernicious form of beriberi.

To summarise, there is effusion in all serous cavities, especially in the pericardium; dilatation and hypertrophy of the heart, with congestion of the liver, spleen, kidneys and brain. The duodenum and upper portion of the jejunum also show congestion. The suprarenals are congested. The blood is dark and fluid. The muscles are dark red in colour, especially the calf muscles, and serous fluid exudes from them on pressure. The specimens of heart and calf muscles were examined by Dr. T. Bhaskara Menon, M.D., M.R.C.P., and his findings are as follows:—

*Heart muscle.*—Veins engorged and full of blood. Some of the muscle fibres are swollen, and there seems to be slight increase of lipochrome pigment. In places, the muscle fibres



MAP A.

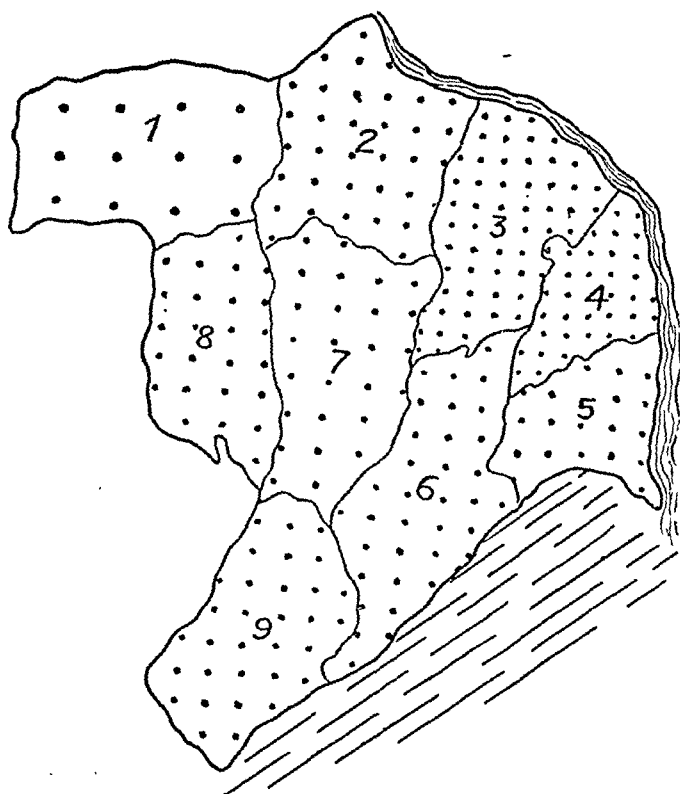
*Rice factories and distribution of milled rice.*

F .. Factories.

The directions of arrows represent the exportation of rice.

MAP OF GUNTUR DISTRICT.

MAP B.

*Distribution of beriberi.*

- |                  |             |                 |
|------------------|-------------|-----------------|
| 1. Palnad.       | 4. Tenali.  | 7. Narsaraopet. |
| 2. Sattenapalle. | 5. Repalle. | 8. Vinukonda.   |
| 3. Guntur.       | 6. Bapatla. | 9. Ongole.      |

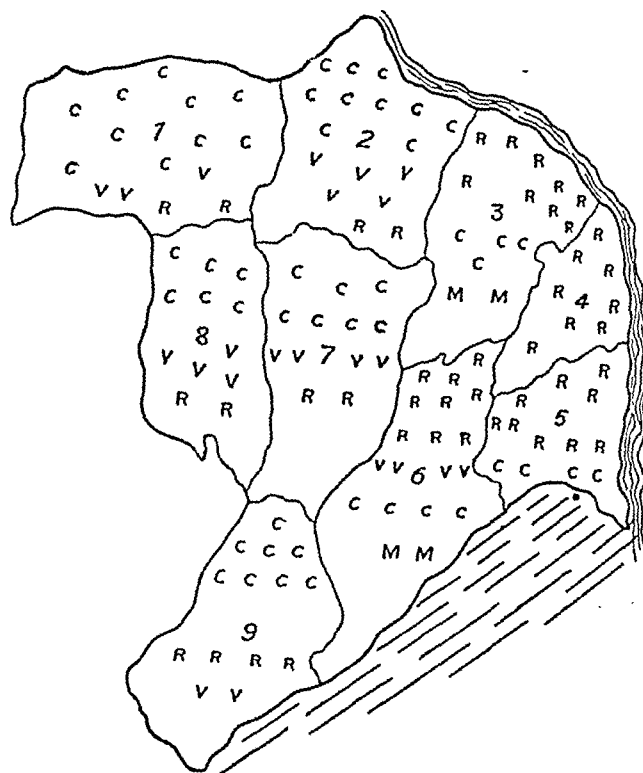
are thin and atrophied. There is no increase of interstitial tissue. The fibres show segmentation and fragmentation.

*Section of calf muscle.*—As compared with the normal calf muscle, the fibres are widely separated and atrophied. Between the fibres there is loose connective tissue. There is no proliferation of the sarcolemma nuclei such as is met with in myopathies.

*Signs and symptoms.*

Clinically, the term beriberi has been applied to a number of conditions. McCarrison from

MAP C.

*The different staple articles of diet in different parts of the district.*

- |   |    |         |
|---|----|---------|
| R | .. | Rice.   |
| C | .. | Cholam. |
| V | .. | Variga. |
| M | .. | Maize.  |

experiments on pigeons has classified polyneuritis aetiologically under the following headings:

- (1) Polyneuritis columbarum (avitaminosis).
- (2) Polyneuritis columbarum (avitaminosis plus infection).
- (3) Infective polyneuritis columbarum (infection plus avitaminosis).
- (4) Beriberi columbarum.

General Megaw has given a provisional classification as follows:—

1. *The Beriberi Group or Rice Intoxication Disease.*

Epidemic dropsy.  
Probably parboiled  
rice intoxication.

Beriberi. Probably  
polished rice  
intoxication.

## 2. *Avitaminosis B or Polyneuritic Avitaminosis.*

In our investigation we have given the name beriberi to a definite disease which can be diagnosed clinically, and exists in the following different forms:

- (1) Larval stage of beriberi.
- (2) Wet beriberi.
- (3) Dry or paraplegic beriberi.
- (4) Acute pernicious form.

1. *Larval stage of beriberi.*—This represents the earliest stage of the disease. Patients generally complain of tingling and numbness. The calf muscles are slightly swollen and tender. There is anæsthesia of the lower extremities and the knee jerks are either diminished or absent.

2. *Wet beriberi.*—In our opinion beriberi is always wet beriberi since we have not seen a case without œdema at the onset.

half, involving the calf muscles. As the disease progresses, the swelling may extend to other regions of the body and in some cases may give a water-logged appearance.

On examining one of the patients carefully, we find ordinarily with regard to the—

1. *Gait.*—There is nothing special to be noticed about it, but weakness and exhaustion of the limbs are present after walking a few yards, but in some cases though the patient looks all right, he is not able to walk even with the aid of a stick.

2. *Circulatory system.*—The heart is always dilated with the left border extending to the left nipple line. In some cases the left border can be found extending 2½ inches beyond the nipple line. The liver is enlarged and tender in some cases.

A systolic murmur is present in the majority of the cases and sometimes it is very difficult

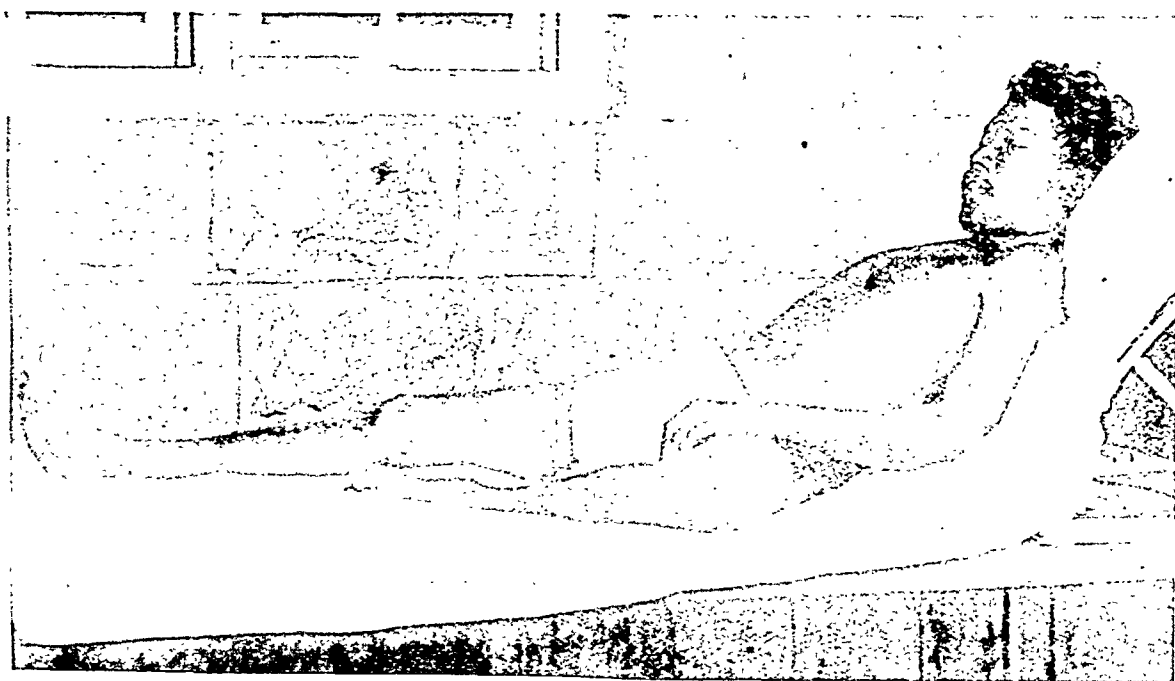


Fig. 1.—Acute pernicious beriberi

*Onset.*—A history of fever of about 5 days' duration could be elicited from about 25 per cent of the cases. This point we specially emphasise because it has got a great bearing on the etiology of the disease.

Tingling and numbness are the first symptoms to be observed by the patient and are found in every case of beriberi we have seen. (Edema of the lower extremities appears next. The swelling is mainly restricted to the upper

to make out whether an organic lesion is present. The question will be easily decided after a few days when the murmur completely disappears.

The pulse rate varies from 90 to 120. The condition of embryocardia described by various authors is seen only in the pernicious form.

Blood pressure is usually low, 90 to 110 systolic, 60 to 80 diastolic.

This fact was made use of to distinguish clinically beriberi from kidney disease.

The blood picture shows nothing special except for the fact that in some cases there is slight leucopenia. The Wassermann reaction is negative.

3. Respiratory system.—Effusion of fluid in the pleural cavities is the only clinical symptom present, and this is only a part of the effusion in other serous cavities.

4. Digestive system.—Epigastric pain is the only symptom present. Vomiting and diarrhoea were not observed in any of the cases in our series.

5. Kidney.—Urine—specific gravity 1010 to 1020.

Reaction	..	..	Acid.
Albumen	..	..	Nil.
Sugar	..	..	Nil.

Occasionally a few red blood corpuscles.

The urea concentration test, for estimating renal function, was done only in a few cases. No definite conclusion could be drawn from these figures.

3. *Paraplegic or dry beriberi*.—This is only the advanced stage of wet beriberi with paralysis of all the affected limbs. The patient walks with a stick with typical ataxic gait and foot drop. The calf muscles are atrophied and are extremely tender on pressure.

Cardiac symptoms are not present in any of these, but when they get œdema and signs of cardiac distress, dilatation of heart with tachycardia was observed.

4. *Acute pernicious forms*.—Five out of the 91 cases admitted during the year were of this variety. The patients complained of tingling and numbness and fever of a week's duration ranging between 99 and 102°F. They are absolutely bed-ridden, with orthopnea and œdema of the lower extremities or of the whole body (the scrotum is not swollen in any of these cases). The muscles are extremely tender all over, especially the calf muscles. The knee jerks and tendo Achillis jerks were either diminished or absent. Loss of cutaneous sensation was restricted to the lower extremities.

The most important symptoms are those related to the circulatory system. The heart

Specimen A.



Specimen B.

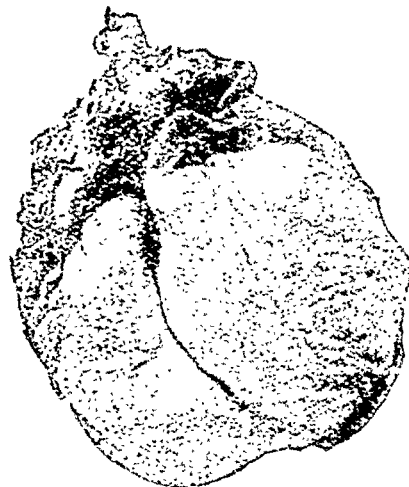


Fig. 2.—Heart in beriberi.

Specimen A .. Weight 16 ozs.  
" B .. " 14 "

6. Nervous symptoms.—Sensory disturbances are manifested, such as tingling and numbness and anæsthesia of the lower extremities. There is no circumoral anæsthesia as described by other writers. Tenderness of the calf muscles is a constant symptom.

*Motor symptoms*.—There is paresis of the affected muscles but no definite paralysis. The knee jerks are either diminished or lost, but never exaggerated in the earliest stages of the disease. The triceps and supinator jerks are present, but absent only in cases in which the extensors of the wrist are paralysed.

shows dilatation of both the right and left chambers. The left border is 1 to 1½ inches outside the nipple line. Enlargement of the liver was present in all the cases, but no cyanosis. A systolic bruit was present in the mitral area, with or without embryocardia. In one extreme cases of failure of the right side of the heart, all the superficial veins were enlarged and pulsating. The blood pressure in this case was systolic 110, diastolic 94. One is in a dilemma as to what should be done in such cases. To relieve the engorged right heart and liver, venesection is certainly indicated, but the

great danger of lowering of blood pressure has to be borne in mind. We suggest administration of  $\frac{1}{2}$  c.c. of adrenalin before and after venesection in such cases.

Vomiting, hiccough, and suppression of urine are grave symptoms.

*Recurrence of beriberi.*—Beriberi does not produce an immunity. On the other hand there is a tendency for recurrence. It comes on once a year, and may occur twice or thrice in exceptional cases. Symptoms of recurrence are:—

- (1) weakness of the lower extremities with paralysis of the limbs;
- (2) œdema of the lower extremities;
- (3) loss of knee jerks;
- (4) in some cases dilatation of the heart with a systolic bruit.



Fig. 3.—Wet beriberi with œdema of the legs and calf muscles.

#### Diagnosis.

It is easy to diagnose a case of beriberi showing œdema of the legs, tenderness of the calf muscles with tingling and numbness of the lower extremities, loss of the knee jerk, cardiac dilatation, and a systolic bruit in the mitral area. The difficulty arises only in cases when all these symptoms are not present. Here, in this place, a man coming to the hospital with a history of fever of a few days' duration, weakness of the lower extremities, œdema of the calf muscles, with tenderness and anæsthesia of the legs, with loss of the knee jerk is always suffering

from beriberi. The fact that these are true cases of beriberi can be seen from the patients with the above symptoms who have refused to remain in the hospital, have come back again after a few days with the typical symptoms of beriberi, with cardiac dilatation and a systolic bruit in the mitral area.

Paraplegic cases are easily diagnosed by the gait, wasting and tenderness of the calf muscles, anæsthesia, loss of the knee jerk and previous history of a localised or generalised swelling.

#### Differential diagnosis.

The differential diagnosis of beriberi from ankylostomiasis, heart diseases and kidney diseases is not at all difficult if one remembers the following cardinal points:

1. Tingling and numbness with anæsthesia of the lower extremities.
2. Œdema of the lower extremities with extreme tenderness of the calf muscles.
3. Loss of the knee jerk.
4. Cardiac involvement (this is not a constant symptom).

*Sub-acute rheumatism* may simulate beriberi in œdema and tenderness of the muscles, but there is neither loss of the knee jerk nor disturbances of sensation. There is a prevalent idea that rheumatism is rare in the tropics, but it is a common disease in this district.

*Locomotor ataxy.*—We have not seen a single case of locomotor ataxy so far in this place. One might be surprised to find that parasyphilitic lesions are not present in a place that shows a very high incidence of syphilis. Probably the prevalence of malaria will account for the absence of such manifestations.

We need not mention the differential diagnosis of paraplegic beriberi from other forms of toxic neuritis due to alcohol, arsenic, etc.

*Post-puerperal neuritis.*—We had five cases during the last 18 months. This disease is entirely different from beriberi occurring in pregnant women. The symptoms are weakness of both the legs and inability to walk, coming on three or four weeks after pregnancy. This condition has nothing to do with instrumental delivery. But in all these cases there was a slight white discharge from the uterus. Col. Hingston suggested sub-involution of the uterus and sepsis as the cause of this condition and we entirely agree with him. The patients get well when the discharge stops.

*Avitaminosis B.*—As far as we know, General Megaw was the first to point out the existence of such a condition existing in man. We had four cases during the course of the year. They simulate paraplegic beriberi, but differ in having no œdema at any time. They respond well to vitamin B.

*Deficiency œdema.*—Chronic starvation is an essential condition in this case. There is no disturbance of sensation, and the knee jerks

are either present or exaggerated. By graduated diet they get well.

*Treatment.*

1. Rest in bed is essential, especially in cases showing cardiac involvement.

2. Diet.—Milk 2 pints, bread 12 ozs., plantains 2.

Rice is completely withheld. We had two cases in which the symptoms recurred on putting the patient on a rice diet, but recovery soon followed by cutting off the rice and putting

Salvarsan is given in small doses of 0.15 to 0.3 gram. Improvement is rapid in some of the cases. Care should be taken in administering salvarsan to cases showing cedema or cardiac dilatation. It is better to wait till the acute symptoms subside. Myosalvarsan is less toxic and is a safer drug than salvarsan.

4. *Vitamin*.—Vitamin B is administered in the form of toddy. Toddy (6 ozs.)..2 ozs... t.d.s.

The toddy is two-day old. This we give



Fig. 4.—Dry or paraplegic stage of beriberi. Patients have improved considerably, so the wasting of muscles is not clearly seen.

the patient back on to milk and bread. When patients are discharged from the hospital we always advise them not to take rice for at least three months.

3. Medicine.—Tonics: (1) Strychnine, (2) Iron, (3) *Arsenic*, is given in these cases not by the mouth but by injections in the form of salvarsan or myosalvarsan.

with the definite purpose of giving fresh yeast. The only objection that can be raised against it is the presence of alcohol which might produce symptoms of alcoholic neuritis. This is not borne out by our experience. The patients rapidly improve. We think that toddy is the cheapest and the most efficient form of giving vitamin B.

Meat, eggs, fruit, etc., are always added to the diet to improve the general condition of the patient.

Bemax is another form of vitamin B that can be administered to patients who have got a prejudice against toddy.

5. When the muscles show signs of atrophy, massage and graduated exercise are always recommended. When patients are able to walk, we advise them to go round the hospital compound morning and evening.

#### *Acute beriberi with dilatation of the heart.*

1. Absolute rest in bed.
2. Injection of adrenalin, 1 c.c. twice a day, atropine, 1/100 gr. once a day.

The idea of giving adrenalin requires some explanation.

The blood pressure is low in these cases (90 to 100 mm. systolic, 60 to 80 mm. diastolic).

After two or three days' injections the blood pressure comes up to 120 mm.

3. Venesection.—Withdrawal of 10 to 20 ozs. of blood relieves the dyspnoea. The low blood pressure does not contra-indicate venesection. But to prevent great fall of blood pressure we advocate  $\frac{1}{2}$  c.c. of adrenalin before and after venesection.

4. Restlessness.—Patients get much relief by injections of hyoscine hydrobromide 1/200 gr. (not to be repeated within 24 hours).

5. Tincture of digitalis 20 mm. every four hours for the first 48 hours has given very good results.

6. Diet.—Only fluid diet with toddy. Solid diet is added as convalescence proceeds.

#### *Ætiology.*

We have reserved the discussion of the ætiology of beriberi to the last, because it is based mainly on epidemiology, pathology, symptomatology and treatment.

We give below four different types of diets taken by patients suffering from beriberi:

##### *Type I. (Case No. 5.)*

Rice (milled)	.. 16 ozs.
Vegetables	.. (Brinjals, ladies' finger and cucumber.)
Dhal	.. 2 ozs. on alternate days.
Buttermilk	.. $\frac{1}{2}$ pint per day.
Mutton	.. $\frac{1}{2}$ seer twice a week.
Fish	.. $\frac{1}{2}$ seer once a week.
Ghee	.. 1 teaspoonful a day.

This diet is quite a satisfactory one and is not deficient in any of the proximate principles of diet.

##### *Type II. (Case No. 9.)*

Rice (milled)	.. 4 ozs. in 10 days.
Maize	.. 12 ozs. thrice a day.
Vegetables	.. 30 ozs. every day (green leaves, brinjals, ladies' fingers, etc.)
Dhal	.. 1 oz. once in 3 or 4 days.
Buttermilk	.. $1\frac{1}{2}$ pints a day.
Mutton	.. 4 ozs. twice a month.
Fish	.. 4 ozs. twice a month.

##### *Type III. (Case No. 7.)*

Rice (milled)	.. 20 ozs.
Vegetables	.. Nil.
Dhal	.. 4 ozs. a day.
Buttermilk	.. $\frac{1}{2}$ seer daily.
Ghee	.. 1 teaspoonful daily.

##### *Type IV. (Brahmin's diet—Case No. 11.)*

Rice (milled)	.. 16 ozs.
Dhal	.. 4 to 6 ozs. daily.
Milk	.. Occasionally.
Vegetables	.. Brinjals, cucumber, etc., 4 to 6 ozs. a day.
Buttermilk	.. 1 pint a day.
Ghee	.. 2 tablepoons daily.
Fruits	.. Occasionally.

The above tables with the exception of Type III show that beriberi cases occur in individuals supplied with all the essential principles of diet and vitamins.

#### *Rice in relation to beriberi.*

See maps of Guntur District.

The following table gives the staple articles of diet, arranged in order used, in this district in relation with beriberi:—

	Staple article of diet,	Number of cases of beriberi.
1. Guntur	(a) Rice .. (b) Cholam .. (c) Maize ..	347
2. Tenali	Rice ..	200
3. Bapatla	(a) Rice .. (b) Cholam .. (c) Variga .. (d) Maize ..	144
4. Narsaraopet	(a) Cholam .. (b) Variga .. (c) Rice ..	49
5. Rcpalle	(a) Rice .. (b) Cholam ..	41
6. Ongole	(a) Cholam .. (b) Rice .. (c) Variga ..	41
7. Sattenapalle	(a) Cholam .. (b) Variga .. (c) Rice (used by very few people).	35
8. Vinukonda	(a) Cholam .. (b) Variga .. (c) Rice (used only by very few people).	17
9. Palnad	(a) Cholam .. (b) Variga .. (c) Rice (used only by very few people).	10

These show that beriberi is more common in places where rice is the staple article of diet: 52 rice factories in this district are milling rice. The consumption of rice is shown in Map C.



But the major portion of the rice is exported outside the district. We had ample opportunities of seeing the whole working of the factories. The following facts only require comment:

1. Beriberi was present in this place before the introduction of rice mills.
2. The paddy that is brought for milling is not kept for more than three days.
3. Parboiling is not done in this district.
4. Two kinds of rice are available for consumption.

(a) The partially polished rice (the first polished rice) which contains the pericarp and hence sufficient vitamin B.

(b) The finally polished rice (the second polishing) which contains only a small amount of pericarp, and hence vitamin B is deficient in this sort when compared with the previous polishing.

5. Rice is not stored in the factories for more than three days.

The first specimen A is the cheaper of the two and is used by the ordinary labourer and contains more of vitamin B than the second or highly polished rice. It is evident that milled rice deficient in vitamin B is not the sole cause of beriberi.

Too much emphasis has been laid on the fact that over-milled rice forms the main article of diet among the ordinary coolies; our experience is that it is the under-milled rice.

*Deficiency of vitamin B.*—We have not carried out any experiments on animals to show that deficiency of vitamin is one of the factors in the production of beriberi. Our experience is mainly restricted to the therapeutic test with vitamin B on beriberi patients. All rapidly respond to the administration of vitamin B.

*Infection.*—The occurrence of fever in about 25 per cent. of the cases at the onset of the disease is in favour of an infection. An attack of dengue fever, influenza, etc., might bring on an attack of beriberi in a predisposed individual and might make us pause before accepting that the fever that is present at the onset of beriberi is one of the symptoms of the disease. But the course of the fever does not fit in with any of the recognised fevers in the tropics.

The great problem that has puzzled all those that have gone into the problem of beriberi is that of any two sets of people living on the same diet without any difference at all in the accessory food factors, only those in the endemic area get it, whereas others do not get it.

McCarrison says, "the ultimate cause of the disease is not the negative factor of vitamin insufficiency, but a positive and a toxic agent produced in the course of a disordered metabolism arising out of vitamin insufficiency." If that is so, why should beriberi be restricted to endemic areas?

On looking at Graph 2 we find that an attack of beriberi is precipitated by the onset of the rains; it is extremely likely that the organism, whatever it is, is lying dormant during the hot weather, and multiplies with the onset of the rains. Our contention is that the organism is lying dormant in the endemic area.

In this connection it is interesting to note that we had two cases of beriberi developing inside the hospital, both of them having their beds near beriberi patients.

For some time we were puzzled to find that beriberi patients rapidly improve on the administration of two or three injections of salvarsan. The Wassermann reaction is negative in all the cases investigated.

These observations put us a step forward and suggest that a spirochæte might be the causative factor in precipitating an attack of beriberi in an individual supplied with a diet deficient in vitamin B.

We have to thank General Megaw and Col. Hingston for their valuable advice and criticisms; Dr. Bhaskara Menon for examination of pathological specimens; Dr. E. Sundararama Reddy and Dr. Ramachandran and other medical officers of the district for the help they have rendered in carrying out our investigation.

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#### RESULTS OF INOCULATION OF CHOLERA VACCINE IN NABADWIP (BENGAL).

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and  
B. L. SIRCAR, M.B., D.P.H.,  
Health Officer, Nabadwip.

THE town of Nabadwip is a pilgrim centre with a population of 15,580 and situated on the bank of the Ganges about 65 miles north of Calcutta. The town has no pipe-water supply and is notorious for cholera prevalence. In May last it suffered from a sharp and severe epidemic of cholera, accounting for 61 attacks in about a month. The cases occurred as follows:—1st week—17 cases, 2nd week—21 cases, 3rd week—18 cases, 4th week—5 cases, 5th week—nil. The number of houses infected is 50, of which in only six houses multiple cases occurred. Forty-four houses reported one case each, 4 houses two cases each, 1 house four

cases,\* and 1 house five cases. In both the latter houses the outbreak started with two cases in the house and in the former no inoculation work was performed for want of information of the cases, while in the latter house the inoculation was apparently too late to prevent the development of the subsequent three cases which occurred within 4, 24 and 72 hours of inoculation; of the four houses with two cases each no inoculation was done in three of the houses for want of information and in the fourth house both cases happened simultaneously. The cause of the outbreak could not be definitely ascertained, but from the scattered distribution of the disease all over the town it is presumed that the epidemic was due to the contamination of the river water, which forms the chief source of drinking water supply. The first cases occurred among the resident population and there was no influx of pilgrims till after the epidemic was in progress for a fortnight.

Several of the leading citizens of the town being orthodox Hindu gentlemen did not view with much favour the inoculation proposals of the Health Officer, and consequently no inoculation work at all was done before the actual occurrence of cases. When cases actually started occurring the people in the infected houses showed some inclination to benefit by the results of prophylactic inoculation.

The Health Officer was able to inoculate 500 contacts in the infected houses; 60 contacts in the infected houses, however, refused to get inoculated. Among these 60 uninoculated contacts 3 cases of cholera occurred, while among the 500 inoculated contacts also 3 cases occurred. These three cases occurred in one infected house, one case occurring within 3 hours of inoculation, one case within 24 hours and another 72 hours of inoculation. Prior to inoculation two cases occurred in this house. None of the subsequent three cases, however, can be regarded as failures, as it is generally held that a period of at least 5 to 6 days is necessary to establish the protection resulting from prophylactic inoculation for cholera.

#### Conclusions.

(1) With the exception of 3 cases occurring within 3 hours, 24 hours and 72 hours of inoculation in a house which had already 2 cases, no cases at all occurred among 500 contacts who were inoculated. This in itself cannot but be regarded as a very satisfactory result, as the researches of Capt. Maitra at the Calcutta School of Tropical Medicine have shown that about 70 per cent. of contacts actually get infected when a case of cholera occurs, and that in a third of these the disease may actually supervene. The occurrence of 3 cases among only 60 uninoculated contacts is also noteworthy and serves as a sort of control.

(2) The absence of any evidence of the existence of the so-called negative phase is very

striking. The inoculations were done in infected houses among the contacts, many of whom must have become infected. If anything like a negative phase existed there would have been a regular crop of cases among the inoculated contacts. The absence of any such outburst is a striking proof of the non-existence of any negative phase following prophylactic cholera inoculation.

(3) Prophylactic cholera inoculation, even when carried out when the epidemic is in progress, confers considerable benefit, as in 45 out of 46 primarily infected houses no cases occurred after inoculation of contacts, and in only one house out of 46 houses did cases occur after inoculation of contacts, and even in this instance the cases occurred before there was sufficient time for the development of the immunity following the inoculation (within three days of inoculation).

(4) At the end of the second week when 38 cases had already occurred a large influx of pilgrims took place for the *Dassehara* festival, but the third week produced only 18 cases, the 4th week 5 cases and subsequently none at all. This striking result is believed to be the result of systematic inoculation of contacts, as in the past the ordinary preventive methods have never been able to check epidemics in progress so promptly and under unfavourable circumstances, such as an influx of pilgrims at a bathing festival.

#### THE REMOTE EFFECTS OF NASAL SINUS INFECTIONS.

By F. D. BANA, M.B., M.R.C.S., D.P.H., D.T.M. & H. (Eng.),  
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(Opening discussion at the Bombay Branch, British Medical Association, April 30th, 1930.)

THE subject of sinus infection in the nose is interesting both to the general practitioner and to the specialist. The obvious signs of acute or active sinus infection are discussed in ordinary textbooks with which we are not concerned now. The remote results mostly of subacute or chronic sinusitis manifest themselves as vague and disconnected events and in the absence of a proper clue are sometimes inexplicable. The patient attaches little importance to, and often gives no history of an attack of specific infection, which led to the trouble, with the result that latent sinusitis produces focal infection similar to that produced by pyorrhœa in the teeth, tonsillitis, gastrointestinal and genito-urinary sepsis. The patient complains of disconnected or transient symptoms, which are often considered vaguely to be of melancholic, hysterical or neurasthenic nature. A focal infection is one where the infecting agent is more or less quiescent but pours out either toxic or septic material into other parts of the body, which react to the poison, producing characteristic symptoms. It is to the masterly work of Onodi, and later of two

very distinguished British rhinologists (father and son) E. and P. Watson-Williams that we definitely owe our knowledge the true significance of sinus infection in causing remotely such symptoms as melancholia, rheumatic pains, swellings and other inflammatory attacks of a secondary nature.

The nasal sinuses can be divided into two groups according to their situation. The first or the anterior group consists of the frontal, the maxillary and the anterior ethmoidal cells. Any inflammation or affection of members of this group gives rise to more or less obvious signs such as discharge, swelling, pain and anosmia: hence the involvement of this group may be named the "sinusitis of signs." It is the other group, comprising the middle, posterior ethmoidal and sphenoidal sinuses, which seldom give rise to direct signs, but which cause symptoms when chronically infected. There is no obvious flow from the nose anteriorly nor swelling or pain, but there is often a feeling of tiredness on exertion and symptoms of post-nasal irritability, discharge with hawking or coughing, and disturbances in some other parts of the body. The involvement of the members of the first group is easily made out by direct examination, trans-illumination or roengenography, whilst in the latter nothing can be revealed at times except the post-nasal discharge and a tendency to catch colds repeatedly.

Chronic sinus trouble may be harmless so long as:—

(1) Discharge is free and open; (2) the resistance of the body and immunity is strong; (3) the nature of the infection is non-virulent or mild. It is when any flaw occurs in either of these conditions that sinus infection becomes a menace and focal infection follows. Amongst the remote results of such infection are: (1) Adenitis, either of the lymphatic, the secretory or the excretory glands involving the parotid, the submaxillary, testes, liver, spleen, or the gastro-intestinal glands. (2) Skin affections such as boils, dermatitis, eczema and infarction. (3) Organic lesions in different organs like the lungs, heart, liver, intestine, kidneys, brain, eyes, ears, muscles and fasciæ. There are three ways by which infection travels:—(1) Toxins liberated by chronic infection with the streptococcus, the pneumococcus, the staphylococcus or other catarrhal variety of organisms get absorbed and affect the organs in varying proportions. (2) By direct transmission of bacteria via the blood as emboli. (3) By lymphatic absorption. By whichever way the different organs are invaded the sequence of events is missed if attention is not called to focal infection of the sinuses.

The following are illustrative cases:—

*Case 1.*—F., male, aged 38. Complained of swelling of the left parotid gland, evidently after an attack of influenza two months previously. The swelling increased after chewing solids and especially after eating acid food and fruits and lasted about two months. Prior

to that the patient had lumbago, cured by electric massage. After subsidence of the parotid swelling, the patient had swelling and pain in the left inguinal canal, giving an impulse on coughing through the inguinal ring. Examination of the sinuses by trans-illumination and x-rays revealed no shadow but the post-nasal discharge was abundant. In fact, it was a sub-acute infection of the posterior group of sinus cells, i.e., the sphenoidal and the posterior ethmoidal cells. Washing out the sphenoidal cells with saline on two occasions relieved the patient considerably and so far there is no recurrence of the transient symptoms of pain and aches in any other part of the body.

*Case 2.*—K., male, aged 48. Has chronic infection of the left side of the nose with multitude polypi growing from the ethmoidal region, i.e., suppurative ethmoiditis. Polypi were removed in several sittings, and the post-ethmoidal cells exenterated with Grunwald's sinus forceps and curette. The patient had an eczematous eruption on the fingers and toes which was relieved by the procedure. A melancholic dejected subject at first, he improved wonderfully in temper and body subsequent to the exenteration of the diseased cells.

*Case 3.*—W., male, aged 56. Has chronic nasopharyngitis with constant hawking and spitting; complaints of tinnitus in both ears, more marked in the left ear. There was no clear sinus infection but proximity of the Eustachean tube, the mouth of which was closed by a turgescient swelling, gave rise to tinnitus. An alkaline nasal douche and inflating with 5 per cent. argyrol drops relieved the tinnitus.

*Case 4.*—F., male, aged 50. Complains of sore throat with chronic hawking and spitting of ten years' duration with no ill effects except his being hard of hearing, with noises in both ears said to be acquired after a strenuous outing in Persia. The submaxillary salivary gland on the left side got enlarged and was painful. With no temperature and no fluctuations, the inflammation did not progress to suppuration. The gland was aspirated by puncture and about 2 c.c. of serosanguineous fluid removed. This led to rapid subsidence of the swelling.(1)

*Case 5.*—W., male, aged 54. Suffers from repeated attacks of colds, which are easily caught and last for fifteen days on end. Examination reveals chronic ethmoiditis with evident pus and numerous polypi. Complains of a feeling of tiredness and cough ever since he had the first cold, which was about five years ago after an attack of influenza. Takes saline nasal douches but without permanent relief, and is unaware of sinus infection. Eyes always water with gumming of the lids in the morning, a condition due to a mild conjunctivitis and involvement of the Meibomian glands of the eyelids.(2) The secretion is excessive at night and occurs when reading or writing in artificial light. Has chronic backache, a condition due to toxic absorption affecting muscles and fasciæ of the back. Last year developed an ischio-rectal abscess after a slight initial injury, which was operated on. Removal of polypi with exenteration of ethmoid cells has relieved him considerably now.

*Case 6.*—A very good example of focal sepsis. Dr. D., medical officer of health of a large town, had been in a chronic state of bad health for the last five years. Suffered from rheumatism two years ago of the small joints of the hands and synovitis of the right knee joints, crippling him for six months, said to be the result of an attack of influenza. Had constipation. The abdomen was x-rayed for this and he was treated with various intestinal disinfectants ending with Dimol with no good results. Lately he had had cacosmia (a bad smell from nose and mouth) for which he sought advice. On examination, post-nasal discharge with septic tonsils were found. The left tonsil was not enlarged but was elongated and showed some scarring due to the bursting of an abscess. On forcing out the anterior pillar of the fauces cheesy material was squeezed out of the supra-tonsillar fossa. The right tonsil was smaller and had plugs of septic material.

The patient was advised complete enucleation of the tonsils. Evidently the tonsils were secondarily infected from the posterior group of sinuses, which remained in the latent infective condition with active foci in the former.

Thus obscure and doubtful cases of painful affections of parts of body without any obvious cause should remind one of focal sepsis somewhere. Next to sepsis in the teeth, and the tonsils, one's attention should be drawn to the nasal fossæ and an examination should be made of the sinuses. As in some of the cases cited above there may be very few signs relating of sinus infection, though this may really be the focus from which toxic or septic absorption occurs. E. R. Falkner(3) says, "The remote effects of focal sinusitis which may properly be classed as complications include all that great category of ills, the causation of which is now ascribed to focal infection anywhere. It includes many of the diseases which were formerly attributed to syphilis, and in fact many of the degenerative results supposed to be peculiar to syphilis can be duplicated by a pus focus with absorption going on for a long period of years. Even the gumma or syphilitic granuloma is occasionally found associated with a pus focus infected with streptococci or staphylococci. The arterial changes in the small thin-coated vessels, such as the choroid and the retina with hæmorrhages are often found associated with a pyogenic infection in the nasal sinuses. The chronic inflammatory processes due to a pus focus may be enumerated: inflammatory process in all the tissues of the eye; labyrinthitis; bronchitis and pulmonary abscess; gastric ulcer; cholecystitis and cholangitis; appendicitis; nephritis in its various forms; pyelitis and cystitis; arteritis, myocarditis and endocarditis; simple and malignant arthritis; myositis; bursitis and neuritis. Whenever and wherever in the body a chronic inflammatory process has been initiated and the origin from a primary focus is suspected, but not obvious, it is well to have a thorough examination of the paranasal sinuses."

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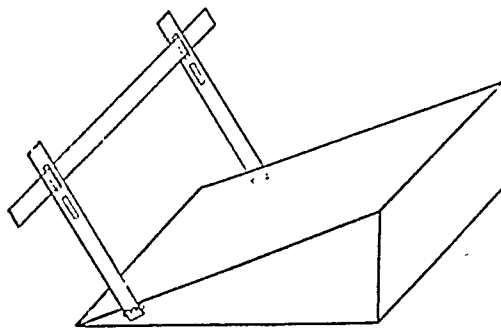
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### A MYOPIA-PREVENTING DEVICE.

By R. K. WADIA, L.O., M.B., B.Sc.

STOOPING over books and close reading is admitted to be a potent cause of myopia, and in consequence the schools have adopted the "hygienic" combined sloping table and chair with a straight back; yet I have not heard of any device for the direct prevention of myopia.

With this intention in view, I have devised a "chin bar," illustrated in the following sketch.



The apparatus consists of a horizontal wooden strip, the ends of which pass lengthwise through two strips fixed at an angle to the sides of the sloping desk by a bolt screw and nut. The horizontal bar passes through different slots at different heights to suit the child's height.

The "chin bar" is tightened in such a position that the chin rests lightly on it and cannot come closer to the desk than 30 to 33 cms. The horizontal bar also prevents the child from trying to look under it at the book. When not in use, the side bars can be folded down by the sides of the sloping desk.

I have had this apparatus in use now for about a year, and in some cases have noted that rapidly developing myopia has been arrested. A few local schools have approved the idea, and state that they intend adopting it. If made of ply wood, the cost of such an apparatus is only 4 annas, or even less if ordered in considerable numbers.

#### CORRIGENDUM.

In Sub-Assistant Surgeon N. C. Dey's article "A Study of Yaws in Khetri Area, Kamrup, Assam" in our issue for August 1930, the following corrections should be made:—

- (1) P. 423, left hand column, in place of "(Plate I, fig. 2)" please read "(Plate III, fig. 11)."
- (2) P. 424, left hand column, in place of "(Plate II, fig. 10)" please read "(Plate IV, fig. 10)."
- (3) In Plate II, fig. 6, in place of "scar over the right knee cap" please read "scar over the left knee cap."

(The first two mistakes are due to the fact that the arrangement of the illustrations had to be altered to fit the pages after the paged proofs had been returned to press; hence the irregular order in which they are numbered.—Error, I. M. G.)

### A Mirror of Hospital Practice.

#### REPORT OF A SECOND CASE OF "DERMAL LEISHMANOID" FROM MADRAS.

By CAPTAIN N. SESHADRINATHAN, M.B., B.S., D.T.M.,  
Bacteriology Department, Medical College, Madras.

"DERMAL LEISHMANOID" cases do not seem to have been reported so far from Madras.

The following case with illustrations may be of interest therefore.



Fig. 1.

The patient, an adult male, is a resident of Wall Tax Road (Park Town), an endemic area for kala-azar, Madras.

*History.*—First attack of fever of a continuous type in December 1927 lasting about six months. Diagnosed as kala-azar by formolgel test in May 1928 by Dr. Theodore of the King Institute. A course of ureastibamine brought the fever under control in July 1928. In September of the same year he had a relapse, and was treated at the General Hospital, Madras. Spleen puncture smear showing *Leishmania donovani*; was discharged cured in November.

In December 1929 the patient perceived small discrete papular nodules above the upper lips, spreading gradually over the rest of the face. The forehead and ear lobules were free. The bridge of the nose showed diffuse nodules. They are distributed over the more vascular areas of the face.

Extensive partially depigmented patches about 2 mm. in diameter are seen over the back of the trunk and sparsely over the front of the chest and arms. The patches did not extend below the waist.

A smear made with the juice from the nodules showed many leishmania parasites. Smears from the depigmented patches did not show any parasites.

There has been no constitutional disturbance associated with the condition. The spleen and liver are not palpable.

The case is thus definitely one of post kala-azar "dermal leishmanoid," the resistant and non-virulent parasites escaping to the periphery

from the internal organs probably by a process of "embolic showers."



Fig. 2.

## A CASE OF CONGENITAL SACRAL TERATOMA.

By G. M. IRVINE, F.R.C.S. (Edin.),  
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THE following case of a tumour present at birth appears to be rare:—

On November 25th Mrs. A. after a normal labour was delivered of a full term female child. At birth this was found to have a large tumour of the right buttock which on examination presented the following characters:—

The tumour was an elongated oval, almost twice the size of the fist. The vertical extent was from just below the crest of the ilium to 1½ inches below the gluteal fold—the lower pole of the tumour projecting down over the back of the thigh. In the horizontal plane it extended almost from the mid-line of the sacrum to the great trochanter. The surface of the tumour was smooth and regular, and the margin fairly well defined except at the upper limit. The lower and internal aspect encroached on the anal margin and on rectal examination was felt to be in close relation to the wall of the lower part of the rectum. The skin over the tumour was slightly reddened and shiny and showed a network of dilated venules. It was freely movable over the tumour. The tumour was slightly movable on the deeper tissues. It felt tense and cystic and doubtful fluctuation was elicited at the summit. Exploratory puncture yielded a few drops of clear glairy mucoid fluid.

Apart from the tumour the child was otherwise normal. The birth weight was 8½ lbs. and it continued to thrive and put on weight normally. The pelvis and trunk were apparently normal and apart from the fact

that the tumour by its size interfered mechanically with full extension of the right thigh the movements of the hip joint were normal.

A tentative diagnosis of a benign tumour, reticular in structure and of dermoid of "inclusion cell" type, was made. As there was no evidence that it was interfering with the general health and normal development of the child, operation was deferred for three months when the child would be more able to withstand the procedure.

On 2nd March the child returned for operation. During the interval no material change in the tumour had taken place. It had not increased in size. The infant had put on weight steadily and was in every way quite healthy.

At operation the tumour was exposed by a vertical incision 5 inches long over the most prominent portion of the tumour. The upper pole was found to be under cover of the gluteus maximus, the fibres of which were greatly stretched and thinned out. This was cut across.

Considerable difficulty was experienced in enucleating the tumour, more especially on its deeper aspects, where it was densely adherent to the surrounding tissues. On freeing the deep aspect it was found to lie directly on the wall of the rectum, about 3 inches of which were exposed in the floor of the wound. Along the line of the rectum the finger could be passed freely into the pelvic cavity. This indicated a defect in the great and small sacrosciatic ligaments, the structures which close the gap between the lateral margin of the sacrum and the ischium, and normally should intervene between the field of operation and the main portion of the rectum.

The gap in the gluteus maximus was closed and the large dead space left by the removal of the tumour was obliterated as far as possible with deep catgut sutures. The wound was closed and a drain inserted at the lower angle.

Owing to the difficulty of protecting the operation area from contamination with intestinal contents, some degree of infection of the wound took place. The depths of the wound were explored and a pocket was located from which about 2 ozs. of foul smelling *B. coli* pus were evacuated. The discharge from the resulting sinus rapidly diminished and 14 days later the wound was soundly healed.

*Pathological report on the tumour.*—The tumour consisted of soft sponge-like material enclosing a large number of cystic spaces. These varied from the size of a large pin's head to that of a small marble and contained clear glairy fluid.

Microscopic examination showed that the framework of the tumour consisted of soft fibrous tissue and that the cystic spaces were lined with squamous epithelium of a primitive type. Scattered nodules of cartilage were present.

The tumour appears to be a sacral teratoma.

*Comment.*—The tumour is apparently a rare one and no reference in the literature can be found to such a condition developing in the foetus during intra-uterine life. It most closely resembles the mixed cell sacral tumour which is believed to have its origin in connection with the developmental remnants of the lower end of the neural canal. The latter, however, are always situated in the middle line.

Presumably the tumour commenced development at a fairly early period of foetal life and grew *pari passu* with the surrounding tissues.

It originated on the site in which normally are found the great and small sacrosciatic ligaments, the development of which was thereby completely prevented. It will be of interest to observe whether these will develop subsequently in response to the normal stresses and strains when the child begins to use its limbs, or whether some permanent instability of the pelvis on that side will result.

Acknowledgments are due to Major F. R. Coppinger, O.B.E., R.A.M.C., who furnished the pathological report, and to Major A. G. Wells, D.S.O., R.A.M.C., who performed the operation for the removal of the tumour.

### THE SO-CALLED "SWALLOWED" FOREIGN BODY.

By COLIN McIVER, M.R.C.S., L.R.C.P., D.T.M. & H.,  
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Superintendent,  
and

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WHEN a patient comes to us with the history of having swallowed a foreign body, we naturally take it for granted that the body has passed into the food passage; and frequently it does so. In some cases, however, it does not get into the alimentary tract at all but passes into the other neighbouring passage, viz., the air passage—and most often into the right bronchus—the shorter and wider of the two bronchi.

In such cases for the first few days after the accident we often get—

- (1) A history of "swallowing."
- (2) Pain—sometimes felt on deglutition.
- (3) Pain on coughing.
- (4) No sign of constant laryngeal irritation, e.g., constant cough, altered voice, hoarseness, etc.

But the most important finding often available after careful questioning is that the pain is *always* felt on *coughing*, but only occasionally on *deglutition*.

In places where X-ray aid is available diagnosis in such cases is at once established by radiography unless the article swallowed is absolutely transradiant to X-rays. But in out-of-the-way places without X-ray help the examining doctor may think that the swallowed body has gone low down into the intestines or passed out with the faeces, as the patient appears a few days after the incident and the occasional pain in the throat may be attributed to the local injury inflicted by the article swallowed, especially if it happens to be a rough one, or to pharyngitis.

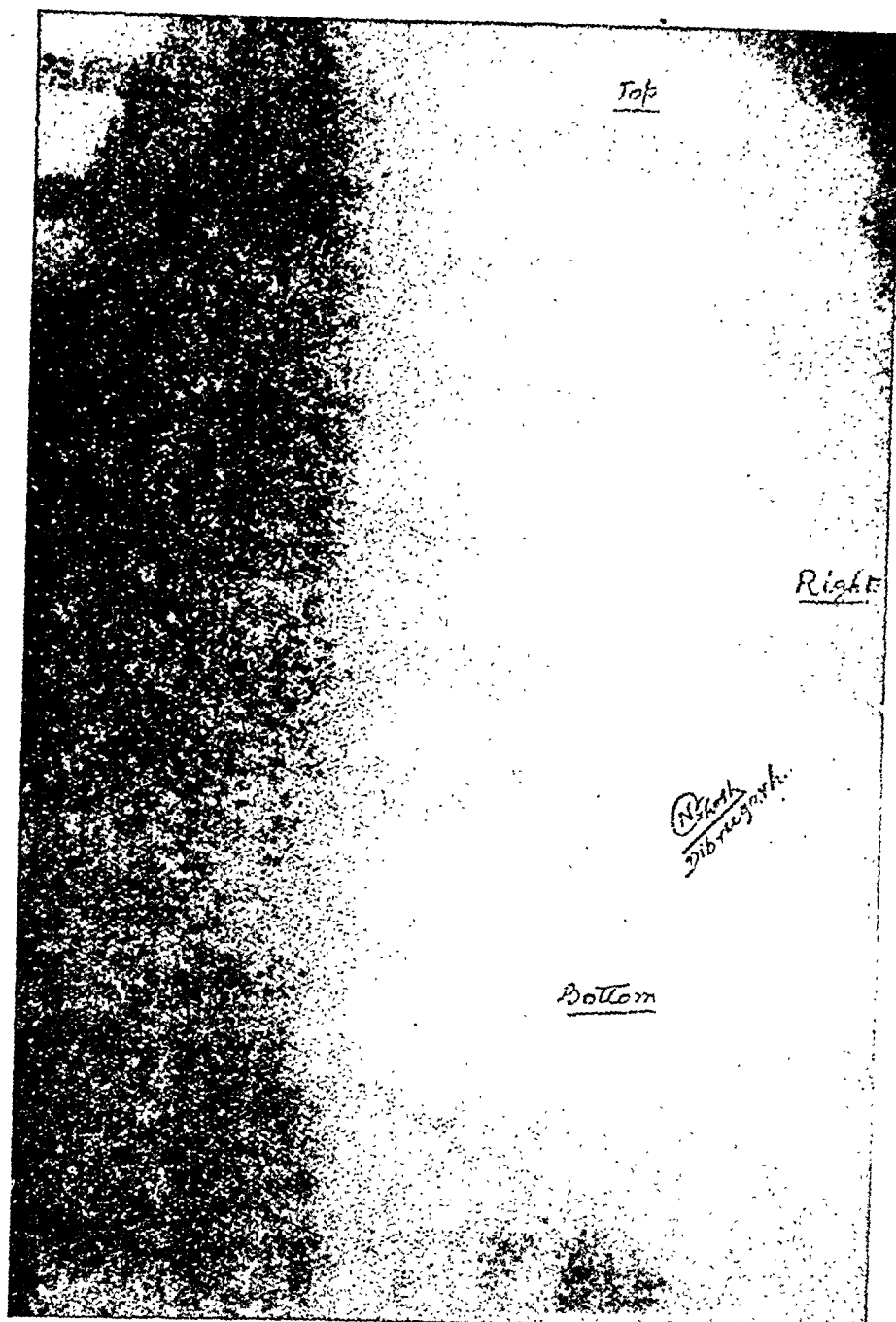
These facts were very impressively brought to the notice of the junior writer by the senior one on 20th May, 1930, when arrangements were being made for the X-ray examination of



a girl who gave the history of "swallowing" a hair-pin, four days previously. She felt a prick in the throat especially during cough—otherwise nothing noteworthy was either complained of or found on ordinary physical examination. X-ray examination however re-

"swallowing" is in reality "sucking into" the air passage.

It therefore appears that careful interpretation of the history in such cases may help correct diagnosis in places without X-ray installations.



vealed a hair-pin in the right bronchus as shown in the accompanying skiagram.

The significant part of the history in this case is that as the girl was dressing her hair and also talking to a friend while holding the hair-pin just below its head between her incisor teeth, she happened to laugh and the pin slipped into her throat.

It may be pointed out that in such cases it is not the swallowing movement that carries the foreign body in but a sudden inspiratory rush of air that draws it inwards. It gets into the air passage and rapidly passing the larynx lodges itself inside the trachea or one bronchus—often in the right one. So what is called

## AN UNUSUAL CASE OF PROLAPSE OF THE UTERUS.

By P. N. MOZUMDER, M.B.,  
Tangail (Mymensingh).

A WOMAN aged about 20 years, very thin, a multipara, had a normal labour on the 30th December last, 1929. On the 1st January while feeding her child she felt something coming out of her vagina. This she described as a "fleshy mass." On the advice of the village *dai* a qualified medical man was sent for and I saw the case on the 2nd January.

I found the uterus completely inverted and in a filthy condition with earth, dirt, etc., stuck all over it. I

washed the uterus at first with hot sterile water, then with iodine solution and lastly with hot normal saline solution for half an hour. I then examined it minutely and found the lowermost part depressed and ulcerated. This part bled on slightest touch. This may have been the site of the placenta. There was no difficulty in micturition or defaecation.

The uterus was easily reduced by means of my fingers, without an-anæsthetic. The patient did not feel the slightest pain or inconvenience during my operation. I then plugged the vagina tightly with sterile gauze and bandaged the part with a "T" shaped bandage. Polyvalent anti-streptococcic serum 20 c.c. was injected for fear of sepsis. I attended the patient for a week and douched the vagina every day with hot normal saline solution. When I found the uterus restored and fear of sepsis was over, I put the patient in charge of a local doctor. The douching was continued for some days more.

The patient made an uneventful recovery. The case is remarkable in that the patient suffered no shock or hæmorrhage, nor did she appear to be in any pain.

### A CASE OF SYRINGOMYELIA.

By RABINDRA NATH CHOUDHURI, M.B.,

Senior House Physician, Medical College Hospitals, Calcutta.

AN Anglo-Indian patient, Miss I. B., aged 30 years, was admitted to hospital on the 7th December, 1929, for inability to walk and weakness of the hands. She had noticed progressive weakness of the extremities especially of the right side for about a year.

The first sign in September 1928 was a sense of "tightness" in the thighs making walking uncomfortable. This was followed by "shooting" pains in the toes especially of the right side. Walking became rather painful and she could only do so with a limp. Pain later subsided, but she was left with great weakness of her right leg so that she had now to drag her right foot while walking. In May 1929 she first noticed weakness in the right hand and some time later in the left hand.

There is nothing of importance in her family history. She is a nurse herself. General health is good. Regarding past illness she had small-pox in her childhood and typhoid fever seven years back.

A routine examination of the nervous system showed signs of an upper motor neurone lesion in the legs and of a lower motor neurone lesion in the hands along with marked sensory disturbances over an extensive area of the body.

There was great impairment of voluntary movements of the fingers in the right hand so that she could not write. The left hand was similarly affected but to a less extent.

Nutrition of the hand muscles was poor. Thenar, hypothenar and interossei muscles were distinctly wasted, more marked on the right side than the left. The muscular atrophy was strictly limited to these muscles. There was, however, no "claw-hand." Electrical reactions were of normal weak type. There was no reaction of degeneration. Leg muscles were not wasted excepting slight disuse atrophy in the right leg. Muscular co-ordination was good.

Disturbances of sensibility were very marked and characteristic of the "dissociated sensory loss." There were extensive areas exhibiting this interesting

phenomenon. There was complete loss of "heat," "cold," and "pain" sensations over the entire left lower limb, front and back of the chest, left half of the abdomen, and the inner aspects of both upper limbs. "Touch" sensibility was variable in different affected areas. "Light touch" sensibility was more or less lost on the inner aspects of the upper limbs and on the whole of the lower limbs excepting the right gluteal region. "Deep touch" sensibility was intact all over. There was, however, no impairment of tactile sensation (light or deep) over the chest and abdomen. Sensibility to position, to vibration, to passive movements and to the appreciation of location upon the skin were relatively or entirely intact. The stereognostic sense was normal.

Knee jerks and ankle jerks were exaggerated in both legs. Ankle clonus was markedly persistent on the right side but absent on the left side. Patellar clonus and Babinski's extensor response were present in both sides. Tendon jerks of the upper limbs were absent. Sphincter control was normal.

There were no definite trophic changes. It is, however, worth mentioning that the right index finger was slightly swollen over the first phalanx. She had noticed it only recently and there was no pain. Another interesting thing that the patient had noticed of late was occasional blueness over left finger tips.

General intelligence was good. Cranial nerve functions normal. Fundus oculi absolutely healthy. Pathological reports—Nothing special except slight anemia and Wassermann reaction negative. X-ray—stereoscopic pictures of cervical spine showed haziness about the lower cervical region with slight scoliosis.

Salient features of the case are:—

- (1) Upper motor neurone lesion in lower limbs.
- (2) Lower motor neurone lesion in upper limbs.
- (3) Dissociated anæsthesia.
- (4) Age.
- (5) Slow progress.
- (6) Spinal change.

Syringomyelia is undoubtedly the disease *par excellence* which can account for the simultaneous occurrence of the numerous and characteristic signs in the case. It is a disease caused by the overgrowth of gliomatous tissue arising most likely in the remains of the embryonic tissues. The glial increase undergoes liquefactive degeneration and is followed by the formation of irregular cavities, which are distended with fluid. The gliosis consists of a thick layer of neuroglial tissue, which everywhere surrounds the cavities and extends further away as a solid mass. In this patient marked changes, perhaps, of this nature have occurred. The lower cervical and upper dorsal regions of the spinal cord are as usual most affected. Extension of the process to the anterior horn of grey matter has caused some atrophy, more on the right than the left side, as evidenced by the atrophy of the hand muscles, especially of the right side. The process has exerted pressure leading to degeneration of the pyramidal and spino-thalamic tracts, especially in the right side of the cord. This explains the analgesia and thermo-anæsthesia on the left side, and spastic paralysis of the right leg. There has been a similar change on the left side, but not so marked, as evidenced by retention of cutaneous sensation to a greater extent on the right side, and retention of more motor power on the left side.

The interesting feature of the case is that the first things that attracted the patient's attention were "tightness" and "weakness" in the legs, and there had been no complaint about sensory loss though it must have preceded the former. This is, however, a notable peculiarity of this disease which is responsible for it remaining undetected for years in spite of the most curious group of symptom-complexes. The individual may live for many years, doing the ordinary duties of life without the least knowledge of the grave condition. The disease is often accidentally detected by the physician, while treating other conditions such as painless burns, ulcers, etc.

*Treatment.*—Having in mind the accepted view of the pathology of the disease the following treatment was given to the patient. The theory of the treatment is to stop the overgrowth of cells, on the assumption that we are dealing with a new growth of the cord, to maintain nutrition of the muscles, and to train the patient to overcome her disabilities.

(i) X-ray exposures to the cervical and upper dorsal regions of the spinal cord at weekly intervals.

(ii) Mercurial inunction.

(iii) Potassium iodide in moderate doses.

(iv) Iron and arsenic injections.

(v) Electrical treatment to the wasted muscles.

(vi) Massage, exercise and training.

Treatment was given for five months with some intervals. The result has been very satisfactory. The patient can now walk without help with a somewhat unsteady gait. She can write. Sensations that were lost have returned over certain scattered areas only. Of course, we do not expect complete recovery, which never occurs. What we hope for is the arrest of the disease for as long as possible and to enable her to move about. Her improvement proves that the destructive process has been arrested.

She was discharged on the 12th June, 1930.

My grateful thanks are due to Lieut.-Col. J. D. Sandes, I.M.S., in whose ward the patient was treated, for his kind suggestions and corrections.

## A CASE OF DERMAL LEISHMANIASIS MISTAKEN FOR LEPROSY.

By S. L. SARKAR, M.A., I.M.S.,  
Civil Surgeon, Noakhali.

THE case was admitted to hospital as one of leprosy, but examination of smears from a nodule showed absence of lepra bacilli and the presence of Leishman-Donovan bodies.

*Previous history.*—On questioning, it was found that about 8 years ago he suffered from enlarged spleen and liver with fever. He was admitted to hospital and treated with injections over a period of about a month. He improved

considerably and was discharged as an in-patient, but continued to attend as an out-patient bi-weekly and he received in all 40 to 45 injections. He remained well for about a year when small depigmented patches appeared which gradually increased in size. Then small nodules like mosquito bites made their appearance on the face. These increased in size and similar depigmented patches and nodules began to appear on other parts of the body. The condition has gradually progressed in spite of various remedies being tried.

*Present condition.*—The lesions in the face closely resemble leprosy (see illustration). The thickening of the skin is especially marked on the eyebrows, but the hair has not been affected, and the ears are not involved.



There are a few thickened patches of skin and nodules on the neck, and on the chest discoloured patches up to the size of a rupee without any thickening of the skin. There is a row of papules like a string of beads along the anterior axillary border on both sides, and the arms and forearms have patches of discoloration and nodules along their inner surfaces. There are a few discoloured patches on the dorsum of the hands but not on the palms. There are a few discoloured and thickened patches but no nodules on the back, and a few small eruptions on the abdomen under the line where the patient fixes his dhoti. The dorsum of the penis and scrotum show patches of depigmentation and there is some thickening of the skin on the latter, which in some instances are definitely nodular. There is slight discoloration on the buttocks. The anterior surfaces of the thighs have many marked patches of depigmentation, and there is a slighter degree of depigmentation on the calves and very faint patches on the exterior surfaces of the legs. The liver and spleen are not enlarged, and there is no sign of other organic disease, the patient apparently being in good health. Kahn's test was negative.

The patient is under treatment with injections of stibosan and appears to be improving slightly.

# Indian Medical Gazette.

OCTOBER.

## MALARIA IN BOMBAY.

WE have known for some time of the existence of a report by Major G. Covell, I.M.S., on the present position of the malaria situation in Bombay, but it is only very recently, thanks to the kindness of Major Covell, that we have received a copy. It is typical of conditions in India that this most valuable and informative report should have been issued as a Local Government publication, of the existence of which hardly anyone knows. We trust that it will be re-printed in the *Records of the Malaria Survey of India*, for it is full of important lessons for malariologists and public health workers in this country.

Bombay has always been notorious for its malaria. Not only does this affect the residents in the city, it also constitutes a menace to Bombay's big export and passenger trade overseas. Thus Tanaka (1929) notes that steamers of the Nippon-Yusen-Kaisha Line trading to Bombay frequently have their crews severely affected by malaria, whereas steamers of the same line trading to Calcutta are not affected. The P. & O. also have had several outbreaks among the crews of their ships in Bombay. Infantile mortality in Bombay is extremely severe—a death rate of 447 per 1,000 of recorded births during the period 1921 to 1925, and very much of this is due to malaria. The general incidence of the disease in the mortality returns occupies the third place, with an annual mortality of just over 3 per mille.

The malaria parasites were discovered to exist in India first by Vandyke Carter in Bombay in 1887, and by 1901 Bombay had gained an evil notoriety for its malaria. Powell (1904) found that malaria was responsible for 2,542 cases out of a total of 3,413 cases of fever among the police force in the city. The year 1908 saw epidemic conditions established, and Liston (1908) found a spleen rate of 80 per cent., and an endemic (parasitic) index of 50 per cent in children residing near the Alexandra Dock. No less than 25 per cent. of *Anopheles stephensi* examined showed malarial infection; this being the first occasion on which this important species was incriminated as a vector of malaria. Bentley (1911) published an extremely important report on the whole subject. He comments that the northern half of the island is relatively malaria-free, owing to monsoon flooding; the southern

half, however, shows hyper-endemic conditions. The all-important vector is *A. stephensi*, breeding in the innumerable wells, cisterns, fountains and tanks. July to October is the season of chief incidence (but conditions for transmission appear to be favourable almost all the year round in Bombay). The malaria of Bombay is not due to importation of infection into the city, but to indigenous causes which could be controlled very readily. He recommended a whole-time malaria officer and staff, legislation to deal with *A. stephensi* breeding in private wells and cisterns, and remarked that if the city of Bombay cared to do so it could abolish malaria within its limits at a cost of one-tenth of the financial loss occasioned each year by the disease.

As the result of Bentley's recommendations, a Special Malaria Department was created in April 1912. Since that date its fortunes have fluctuated; in 1914 and 1915 its staff was very greatly reduced; it was completely abolished (with disastrous results) in 1918; then re-created in 1923. In 1924 the P. & O. began to get busy about the incidence of malaria in the crews of their ships in Bombay, and Government appointed a Central Malaria Committee to secure co-operation of all the different commercial interests concerned, in 1926. Taken all round, however, Bentley's proposals have never been properly put into force, and even such minimal legislation as has been passed has had but little effect owing to the diversity of the interests concerned; Port Trust, railways, commercial concerns, and mill owners. In 1928 the disease was probably more widely prevalent in the southern half of Bombay than ever before. An extremely unfortunate proviso allowed in the legislative measures passed was that "mosquito-proof" covers were permitted for use on wells instead of permanently closed covers; the former trap doors are absolutely ineffective in the vast majority of cases. This concession to popular prejudice has made Bombay pay dearly for her refusal to really tackle her malaria problem; "the principal obstacles to the work of malaria prevention appear to have been the absence of unity of control of anti-malarial operations, apathy and lack of co-operation on the part of owners of property, the inadequacy of legal powers, and in particular the fact that such legal powers as have existed have not been applicable to Government departments, railways, and other public bodies," writes Major Covell.

Turning to the main body of Major Covell's report, the author once again emphasises the supreme importance of *A. stephensi*. He found an infection rate of 4.2 per cent. in this species during a non-epidemic year. Its chief breeding place is in the innumerable and unprotected wells throughout the southern half of the city; children living in houses near these wells show

a spleen rate of 59 per cent., which is 20 per cent. higher than for children living in houses without wells. The supposed mosquito-proof trap doors over wells are hopeless; this measure indeed is worse than useless, for it engenders a false sense of security, where there is every source of danger. There are over 2,400 wells to be dealt with, every one of which is a potential breeding ground for *A. stephensi*. Water cisterns are the second most prolific source of anopheline breeding, and no less than 25,846 such cisterns will have to be dealt with. The covers are inefficient or are left open; holes are caused by corrosion; the wire gauze covering is usually found missing or defective; many are so inaccessible that they cannot be properly inspected. Other important sources of anopheline breeding are the large ponds and tanks in the mill area; fountains, garden tanks, and tubs; collections of water used in building construction; leakages from road watering hydrants; cellars on the Ballard Estate close to the Alexandra Dock with subsoil water collections; pools on the foreshore; and yards containing machinery, scrap iron, etc.

A spleen census was carried out on 27,647 municipal school children throughout the island, and showed rates varying from 1.4 to 40.5 per cent. (mean for the whole city 8.1 per cent.). The parasite indices varied from 1 to 38 per cent. in different areas. These observations were collected between April and August, and the findings once again emphasise the supreme importance of *A. stephensi* as the vector of malaria in Bombay; "in every case where malaria has been found to be present to any serious extent, permanent breeding places of *A. stephensi* have been found in the vicinity." Further, "the correlation between the intensity of malaria and the proximity of mills was most striking," and Worli and Parel are singled out as areas where especially intense malaria has been created in connection with the mills.

Now conditions in Bombay are not unlike those in Palestine. Just prior to the Great War the whole of Palestine constituted one vast malarial incubator, conditions being worse in the Jordan valley than in the coastal plain. Into this malarial incubator were thrown hundreds of thousands of troops, many of them Indian troops already infected with malaria, but the majority of them British and Anzac troops who had never been exposed to malaria before. The results were such as might have been anticipated; they are dealt with in a simply magnificent report by Angus (1919). The British authorities however took the most strenuous precautions; even "no man's land" was oiled at nights under shell fire. (Angus' paper is the finest essay on malaria in war that we have seen, and it is a thousand pities that it was issued as a local publication by the Alexandria Army Press during the war, for very few copies of it can now exist.) Before

the advance on Damascus the general incidence of malaria had been reduced to 5 per cent. among the troops in the coastal plain, and 6 to 7 per cent. for those operating in the Jordan valley. With the advance to Damascus, the troops were fighting for five weeks over terrain in which the Turks had carried out no anti-malarial measures whatever, and the capture of Damascus was followed by a very severe outbreak of malaria, at first of malignant tertian infection, later of benign tertian infection. After the war the health authorities in Palestine under the auspices of the League of Nations commenced to clean up the situation; the results have been quite as remarkable as those in the Panama Canal; and except for the small uncontrolled area around Hulé in the north, malaria has almost been abolished in Palestine; it now exists there merely as a minor disease. (Who paid the bill for this, we do not know; but we expect that the British income tax payer "did his bit.")

In Palestine the one urban anopheline carrier of malaria is *A. bifurcatus*, which breeds freely in wells and cisterns. The anti-malarial measures of the Health Committee of the League of Nations have almost eradicated this species. Bombay presents a similar but smaller problem. Cannot similar results be achieved?

Bentley's proposals, writes Major Covell, have not really received a fair trial. The eradication of malaria from Bombay to-day presents a much more difficult problem than it did in 1911; yet there is only one species of anopheline carrier concerned, and its breeding places *could* be easily dealt with. The cost would be much less than that incurred annually in sickness, death rate, and loss of labour in the mills. And here Covell (in our opinion very rightly) urges the importance of species control, as against an attempt to direct measures against mosquitoes of all species and genera. (In 1928 Sir Ronald Ross stated that species control was not advisable; all that was necessary was to employ a jemadar and coolies to oil all mosquito breeding sites indiscriminately; no trained malariologist was necessary for local malarial problems. With all due respect to so very distinguished an authority, we think that he is wrong. Given a knowledge of which species is transmitting the malaria in the locality, where and at what season of the year it is breeding—knowledge which can only be garnered by a trained observer—then all the men and money available can be thrown into the attack on the carrier species at the right places and at the correct time of the year. It is customary in military operations to outline an "appreciation" of the situation before military operations are begun, and we believe that the same holds true for the attack on the malaria in any locality. Further, unless the jemadar and coolies are supervised by a trained worker, their work will be neglected or wasted.)

We come finally to Major Covell's concrete proposals. The first is for the appointment of a special whole-time malariologist under the municipality; a special malaria committee is all very well, but unity of control is essential. The sub-inspectors should be better paid in order to attract a better class of man. Fresh legislation should be introduced, *and it should be enforced*; for example trap door covers to wells should not be permitted. Every well in the island should be filled in or covered over with concrete, with, if desired, the provision of a pump, before a certain specified date. In the event of non-compliance the municipal commissioners should cause the work to be carried out, and the cost be recovered from the owner. All cisterns should be covered with sheet iron or reinforced concrete. Corrugated iron sheets should not be permitted as coverings for any cistern. Man-hole lids should be provided with a strong pattern lock. Valve boxes to cisterns should be prohibited; and every cistern should be inspected by the anti-malaria staff once a month. Mill ponds should be treated by anti-larval measures once a week, preferably with Paris green. Garden tanks, tubs, and fountains should be demolished, and all stand pipes should be provided with a cement drain connected with the main drainage system. Cellars and collections of water used in connection with building operations should be dealt with—the latter by saponified cresol. Certain enumerated breeding places should be dealt with, as detailed. Full details are given for malaria control in the mills. Labour camps should be removed from the actual site of the works to healthier sites. "The great object is to render every well and cistern in the area absolutely mosquito-proof by the adoption of permanent measures." Finally, such legislation as is introduced must apply to every one of the commercial interests concerned, whether Government departments, railways, Port Trust, or mills; and the most active co-operation of all bodies concerned is most essential.

To summarise, malaria in Bombay, as in most places throughout India, is man made. And man having created what are almost hyper-endemic conditions, is content to adopt a policy of *laissez-faire*, and to let matters get worse and worse year by year. Yet the disease could easily be controlled. It will be of the utmost interest to see what is the result of this valuable report. Is Bombay going to continue to be a hotbed of malaria, or are her citizens going to combine to clean up the situation? "If preventable, why not prevented?" once enquired the King-Emperor with regard to epidemic diseases in the tropical portions of the British Empire. It is difficult to find an answer.

In Calcutta, we have *A. stephensi*, like the beggars, always with us. A recent report in this journal by Basu (1930) outlines the tremendous amount of breeding of this species

which goes on in every cistern, tub, water barrel and the like throughout the city. Under such conditions it would be well worth while investigating why malaria is almost absent from the centre of the city, and only lightly endemic in its environs. Is it the south-west wind which is prevalent in Calcutta throughout the hot weather and the rains which protects us from mosquitoes and malaria? Whatever the cause, it is not the absence of a notoriously active malarial carrying species of *Anopheles*. Not only that, but, as Iyengar has shown, *A. ludlowi*—the great malarial carrier of the Andaman islands—is breeding profusely in the Sunderbunds not far from Calcutta city; and should this species once assume dominance within the limits of Calcutta city, it might introduce hyper-endemic conditions. If severely endemic malaria is an ever present menace to the wealth and prosperity of Bombay city, it is a potential menace to the future of Calcutta city.

There is one profound lesson to be learnt from Major Covell's report; it is that almost always Man creates the malaria from which he suffers. He leaves unprotected wells to breed *A. stephensi*; or borrow-pits along his railways to breed *A. culicifacies*; he clears jungle only to let in *A. maculatus*; or he digs tanks in which the population may bathe and from which they may drink—only to spread a wide variety of communicable diseases. We could almost wish that the Simon Commission had paid some attention to the anopheline mosquitoes of British India; they may have a profound bearing on the political future of the country!

R. K.

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## SPECIAL ARTICLE.

### A REPORT ON THE SECOND INTERNATIONAL CONGRESS ON MALARIA, HELD AT ALGIERS, 19TH TO 27TH MAY, 1930.

By J. D. GRAHAM, C.I.E.,

MAJOR-GENERAL, I.M.S.,

*Public Health Commissioner with the Government of India, and delegate representing the Government of India.*

#### *General.*

IN view of the fact that the Office International d'Hygiène Publique was in session at Paris during the first part of this period, it seemed at first doubtful whether I should be able to attend this Congress; but the fact that so many members of the Office International were also delegates to the Algiers Congress compelled the President of the former to arrange for the more important questions being taken early, thus allowing the majority of the delegates to leave Paris by Friday, 16th May. I left on the evening of Saturday, 17th May, travelling via Marseilles, along with the British Ministry of Health and Royal Air Force delegates (Lieutenant-Colonel James and Wing-Commander Whittingham) and arrived in Algiers at 2 p.m. on Monday, the 19th, having missed only the opening ceremonial function at the Palais des Assemblées Algériennes.

The fact that Congress coincided with the 50th anniversary of Laveran's discovery of the parasite of malaria at Constantine in Algeria and that the centenary celebrations of the taking over of Algeria by France were also being held, all contributed to give the Second Congress certain special features, as well as to the framing of a programme which involved one excursion of some considerable duration.

The League of Nations Health Committee had taken this opportunity to convene a meeting of the Malaria Commission when, amongst other things, they were to have presented to them the report of the Indian Study Tour of the six officers who visited India in the name of the Sub-Commission in 1929. I was authorised to discuss their draft report before its presentation to the Malaria Committee. This matter I have excluded from this report on the Congress as I have dealt with it in a separate note.

#### *Delegates.*

India had three representatives, Major-General Graham, Colonel Christophers of Kasauli, and Dr. Sur of Bengal. Colonel Christophers had come specially from India to assist at the preliminary meeting with General Graham and the officers of the League of Nations Malaria Commission study tour in India. Great Britain was well represented by Lieutenant-Colonel James, I.M.S. (retired), by

Wing-Commander Whittingham, who represented the Royal Air Force, by Dr. Thompson and Dr. Buxton, representing the London School of Tropical Medicine and Hygiene, by Mr. Senior-White, representing the Ross Institute, London. Several other British officers interested in malaria and on leave were present unofficially.

It seemed, therefore, a great pity that such a small contribution to the papers presented at the meeting was forthcoming from Great Britain. I have sought for reasons for this and can only ascribe it to want of publicity of the Congress and its requirements and to great delay in selecting representatives. If men are selected at the last moment, then they cannot have papers forwarded in time, even though they may have them ready. On the other hand, certain countries, like the Dutch East Indies, had several representatives at least one of whom came specially for the Congress at Java. They had had long notice and were prepared with papers. This is a matter which requires a certain amount of attention for future conferences.

#### *Organisation.*

Certain papers had been issued from the Secretariat of the Congress at Algiers; but no copies of any of these or of any precise information regarding the Congress, except the dates, were available at the India Office; nor was any information available in India before I left Simla, as I made special enquiries in view of the fact that I might be asked to deputise at it. Whether this apparent lapse was due to faults on the side of the French Government which originally dealt, I understand, with the Foreign Office in regard to the approaching Congress, or to a failure to transmit copies of documents received in Great Britain is not quite clear; but it led to some considerable confusion and difficulty in making arrangements as these had been entrusted to the Office des Transports et Logements du Centenaire de l'Algerie, 30, Boulevard des Capuchins, Paris, who were prepared to issue tickets on production of Congress membership cards issued before 31st March. This document would have been of great use had it been available in India with other papers. I saw it for the first time at the Ministry of Health just before leaving for Paris on 9th May.

The general organisation consisted of a series of representative Committees, e.g., one of patrons, one of honorary members, one permanent, one executive, and one for the cinquantenaire commemorations in connection with Dr. Laveran. There were six sections dealing respectively with:—

- (1) Biology of the parasites of malaria and other hæmatozoa.
- (2) Biology of mosquitoes.
- (3) Epidemiology, endemicity, statistics, anophelism and malaria.

(4) Malarial pathology in all its branches and blackwater fever.

(5) Therapeutics (all products).

(6) Prophylaxis, propaganda, history, etc.

The five principal European languages, i.e., French, German, English, Spanish, and Italian were used. Membership was obtained in Algiers by payment of Frs. 100, which entitled one to all communications and published proceedings. Members were of three categories:—

(a) those representing Governments;

(b) those representing Institutions in different countries; and

(c) free members, including doctors, biologists, engineers, chemico-therapists and biochemists.

The first three days, 19th to 21st May, were occupied with the opening and other ceremonial functions and the sectional meetings; the 22nd by an excursion to the Mitidja—the great plain between Algiers and the Atlas range—formerly the home of malaria and now a fertile strath. The 23rd was spent at Constantine, where Laveran's memory was honoured; the 24th at Timgad, where his memorial was unveiled; the 25th at Biskra, a frontier post; the 26th on our return journey through Constantine; and on the 27th we arrived back in Algiers. I left Algiers by the steamer on 29th May, reaching Marseilles on 30th May and Paris on 31st.

While in Algiers most of the delegates were housed in the Hotel Saint George, which kept open for the occasion and supplied sufficient accommodation to allow of all sections of the Congress meeting there. This was a very convenient arrangement.

#### *Inauguration Ceremony, Reception and Banquet.*

The Governor-General in opening the Congress at the Palais des Assemblées Algériennes, was supported by all the principal officers of the Government, as well as by the distinguished French savants from the Pasteur Institute, Paris, e.g., Dr. Mesnil, Dr. Marchoux (President), while members and delegates were in the audience. Both the Governor-General and the President des Délégations financières welcomed the members who, through Drs. Marchoux and Lutrario, thanked them.

At the reception at the Palais d'été, Madame Pierre Bordes assisted her husband, the Governor-General, and they were supported by all the high officials and by many Arab chiefs. The Governor-General paid a warm tribute to medical men and scientists, and to the cordial relations between the French and Arab populations. He referred specially to the brothers Sergeant of the Institut Pasteur of Algiers and their collaborators, to the various departments of State medical officers, military and civil, for their great devotion to the cause of ameliorating the lot of humanity in Algeria and

generally in all countries, and proposed the healths of the various foreign Governments.

At the banquet the Minister of Health, M. Désiré Ferry, after Professor Marchoux had thanked him for presiding, thanked the delegates for coming to Algiers and proposed the healths of the 24 nations represented. He assured them of his very great interest in the fruition of their work and efforts; and, after complimenting the local committees on their organisation, he proposed the healths of the French and foreign doctors "qui travaillent sans relâche aux progrès de la science pour le bien de l'humanité."

#### *Work of the Sections.*

(a) On the afternoon of the 19th the sessions opened at the St. George Hotel, the papers in Sections I and II being overtaken. A time limit for speaking brought many to an untimely finish. The German and Dutch elements were particularly strong at the meeting.

(b) On the 20th the sessions were continued, Section III dealt with, especially, endemic and epidemic malaria in Hungary, Japan, Madagascar, Cochin-China, Bengal, Africa, etc.; while Section IV—malarial pathology in all its phases—was also studied in several interesting communications.

In the afternoon several notable communications were made by Professor Ed. Benhamou, e.g., with Dr. Levi-Valensi "L'Azotémie in Malaria"; with Dr. Gille "Bilirubin in Malaria"; with Dr. Marchioni "Heart and Malaria." In the evening in the Grand Theatre of the Faculty of Medicine, Dr. Ed. Benhamou gave an exposé on the proofs of splenic contraction "amongst malaria cases (chez les paludeens)."

(c) On the 21st the sessions continued. This was the most laborious day of the session as it also was that on which the Commission du Paludisme of the League of Nations met.

New communications were made on the pathology and pathological physiology of malaria by Drs. Constantini and Coniot; Drs. Duboucher and Mangeaux; Laffont and Jabier (not distributed); Laffont and Fulconis (not distributed); F. X. Henry; A. Bonnet; Le Bourdellès and Liegois; Cartana, Costella and Torradene Moline (not distributed); and by Le Bourdellès.

Section V dealt with therapeutics, including that of quinine and the alkaloids, propaganda, history, blackwater fever, and gave rise to a mass of discussion.

Special attention was drawn to the very interesting work of Madame Anna Celi-Fraentzel "Comment la Gaule civilisée par Rome se devoua à l'assainissement de Rome au moyen-âge et dans les temps modernes," and that of Colonel Piedallu on "L'élève dans les grands bassins du Jardin d'Essais des petits poissons larvivores appelés Gambouses." Papers were presented by Dr. Lutrario on the League of

Nations malaria activities; by Dr. Schwetz on work in the Belgian Congo; by Dr. Garcopino-Tusoli on work in the Mitidja; by Comte; by the Health Service of Morocco; by Dr. Hussameddin of Turkey (not distributed); by Dr. Soulié on the "History of Malaria in Algeria"; by Vincent; by Zammit; and by J. W. W. Stephens on "The History of Black-water Fever in Africa." A paper on the influence of malaria in Oceania by Professor Dr. A. W. Nienwenhuis was circulated in German. The *Carte du Paludisme en Algérie* published by Ed. and Et. Sergent, Parrot, Foley, Catanei and Senevet was a welcome addition to the literature of the Conference.

(d) At 5-30 p.m., Dr. Schöffner, in the Grand Amphitheatre of the Faculty of Medicine, gave an exposé of the study tour of the League of Nations Malaria Commission in British India. This exposé contained a clear statement of facts and would have adorned the report of the Commission to the Health Committee had it been included. It was interesting and was well received, being illustrated by two very poor maps of India.

He was followed by Dr. Walch of Weltevreden, who gave his exposé, illustrated by lantern slides, of the cleansing of the fish ponds in Batavia and the Dutch East Indies by a biological method, a lecture which I heard him deliver in Batavia in February last, when the Advisory Council of the Singapore Bureau visited the Dutch East Indies.

This finished the serious paper work of the Congress.

#### *Excursion into the Mitidja.*

The Mitidja—the great plain behind the low shore range of hills and the main range of the Atlas mountains—was originally a marshy plain, interspersed with lakes, and was a hot-bed of malaria. It was the *bête noire* of the early French conquerors and colonists as it had been before of the Turks and Romans. Its insalubrity had left it unoccupied and it was a region which had to be hurried through or avoided on the way south. Its malaria history has been written up by Dr. Soulié; and in the monographs by the Sergent brothers, "Twenty-five years' study and prophylaxis of malaria in Algeria" and in other publications. Half a day's drive through this great fertile plain will convince one, more than any words will, of what a great change has been wrought in the plain during the last 80 years. Statistics attest the changes in the amount of crops produced, in the commerce, in the size and wealth of the population, and in the amount of malaria. Places formerly uninhabitable are now orangeries or wheat fields. The excursion was therefore one of peculiar interest to any one interested in bonification methods and their results.

After traversing the forest of Bainem over

the headland of Bouzerea, and the prosperous towns of Guyotville, Staouéli, Zéralda, Castiglione, and Berard, we saw from the plateau on which is "Le Tombeau de la Chrétienne" the plain of the Mitidja; and the Engineer-in-Chief (Roads and Bridges) (M. Balensi) and Dr. Ed. Sergent, Director of the Institut Pasteur of Algiers, explained the original problems and their difficulties. One of these was the lake called "Halloula" which extended almost to the foot of the promontory, and had to be treated by an underground canal. At Oued-el-Alleng we saw the method of daily administration of quinine by tablets and chocolate tablets for the children and also the registers; but there was nothing special in it. At Blida and Boufarik we saw the results of this system of bonification which has been going on for several generations; and we viewed the great monument, just erected by the Government, to the glory of French colonisation. Incidentally, I understand that much of this glory falls to be shared with the Spanish, Arab, Maltese and Italian workmen, who had to stick it out in the unhealthy plain in the early days, and who have largely made it what it is to-day. A *vin d'honneur* in the Tabacop did not dispel this impression. Evidence was forthcoming in many directions of the old malaria, of the amelioration, and of the excellent collaboration of the colonists and the scientific laboratory workers. We saw the orangeries and flower beds of the farm of Chiris (Sainte Marguerite) under M. Poliand and returned to Algiers at 6-30 p.m.

#### *The Cinquantenaire of Laveran.*

Travelling overnight from Algiers, the whole of the Congress members who availed themselves of this excursion arrived at Constantine at 8 a.m. on 23rd May and were able to be present at the ceremonies which took place later at the military hospital where Dr. Laveran had done much of his work and where he made his great discovery in 1880. The ceremony was unforgettable and very well arranged in a room at the military hospital where the delegates, members, visitors and invited public were accommodated. The place was beflagged and there was military music. M. Carles, Prefect of Constantine, presided, assisted by M. le Dr. Liagre, adjoint to the Maire who was absent from Constantine. The foreign delegates were grouped around the chairman and prominent French savants who included Drs. Mesnil, Marchoux, Sergent, Nicolle, Medecin Generals Dopter, Lannes, Rouvillard, Molliès, Bouffard, Broteaux, Gravellet and others. The General Officer Commanding the Division was present.

M. le Prefect paid a tribute to the memory of Laveran in a very good speech, and was followed by the Maire. Then followed a series of medical speakers, each giving us glimpses of the man from many different points of view. Inspector-General Dopter, Director of the

Military Health Service, spoke first. The oration was given by Professor Mesnil of the Academy of Sciences, followed by Professor Marchoux of the Academy of Medicine. When these longer orations had finished, the different representatives did homage to the memory of Laveran in short speeches. The following spoke: M. le Medecin General Bouffard in the name of the Academy of Colonial Sciences; Professor Nicolle of Tunis Institute; Professor Sergeant of Algiers Institute; Dr. Lutrario for the League of Nations and Italy; Lieutenant-Colonel James for Great Britain and India; Professor Ziemann for Germany; Dr. Mohamed el Guindy Bey for Egypt; Professor Franchini of Bologna—an old fellow worker and assistant; Dr. Kling for Sweden, Dr. Walch for Holland; Dr. Ciuca for Roumania; Dr. Copanaris for Greece; Dr. Silber-Schmidt for Switzerland; Dr. Hackett for the U. S. A.; and Dr. de Buen for Spain.

A visit was then paid to the laboratory of Laveran, followed by a *vin d'honneur* and, as a Frenchman put it, "*ainsi se termina*

In the evening at 6-30 p.m. the local medical profession of Constantine, under the presidency of Dr. Barraud, gave the Congressistes another *vin d'honneur* to mark their appreciation of the honour done them by having so many foreign savants in Constantine, to honour one of their nation.

The officers of the military hospital gave a series of postcard photographs of the hospital to each of us. These I have preserved separately to send them to the Director of the Ross Experimental Station (Malaria Survey of India) for special mounting and hanging in the museum, as I thought this would be the best way of preserving such an interesting historical exhibit.

#### *Visit to Batna and Timgad.*

On the 24th the whole Congress journeyed 3½ hours by train to Batna and some 58 kilometres by motor to Timgad—an ancient Roman pleasure city on the old Roman frontier near the garrison town of Lambèse, where the 3rd Legion had been established for 2 centuries.

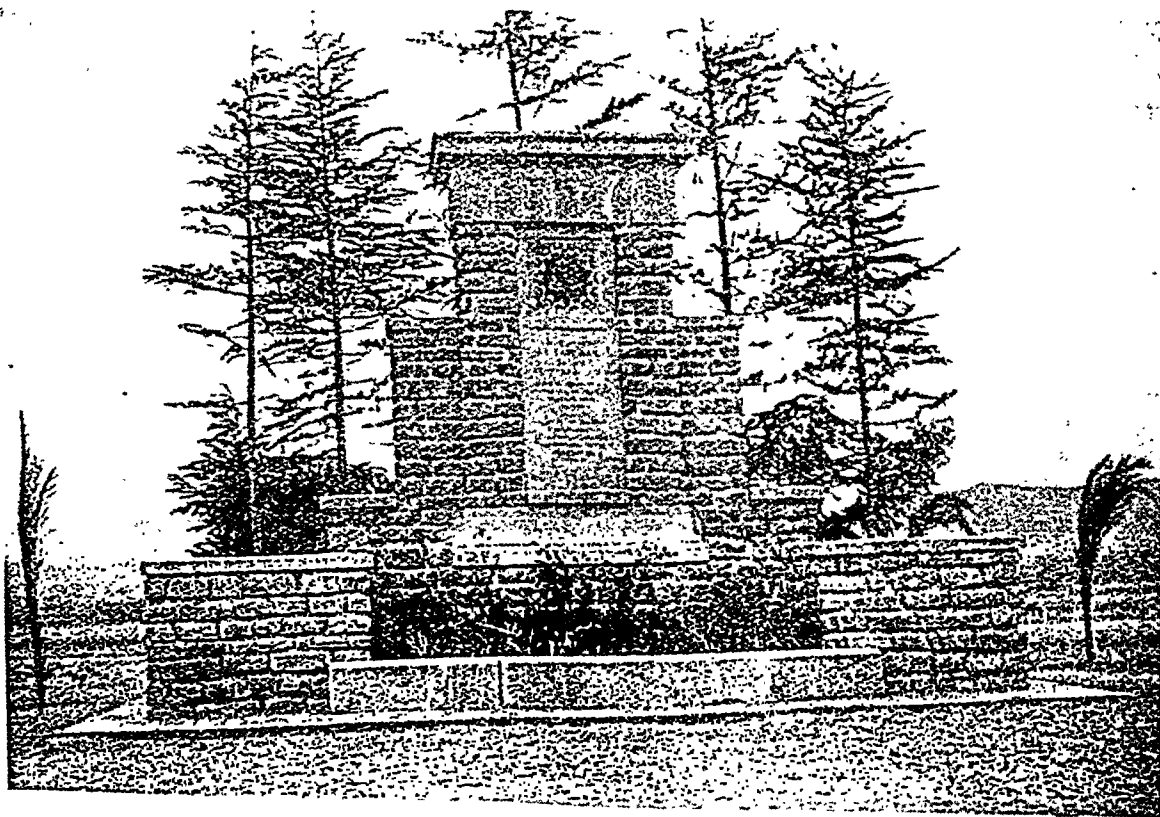


Fig. 1.—The monument at Constantine, Algeria, to Dr. Alphonse Laveran.

*Papothèse du grand savant français aux lieux mêmes ou son travail et ses patientes recherches lui avait permis de réaliser le but qu'il poursuivait."*

Afterwards a banquet of all the participants and Congressistes was held at the Hotel Cirta when Dr. Mesnil and M. le Prefect and the Maire again spoke.

It was in this area that Dr. Laveran had done much of his original field work; and so, at a small post on the Great South Road not far from Timgad, it had been resolved to set up a commemorative tablet and memorial.

On arrival we were conducted to chairs in front of the memorial, which is on the roadside opposite the entry to the post (*vide* Fig. 1).

The sub-prefect addressed the assembly and was followed by Dr. Ed. Sergent, who briefly described the steps leading up to the erection of the memorial. Professor Mesnil also made

with some light refreshments in the local caravanserai, after which we proceeded to Timgad—the Pompeii of Algeria. With such signs of former opulence and luxury one cannot think



Fig. 2.—The French military outpost near Constantine at which Laveran discovered the malaria parasites. November 6th, 1880.

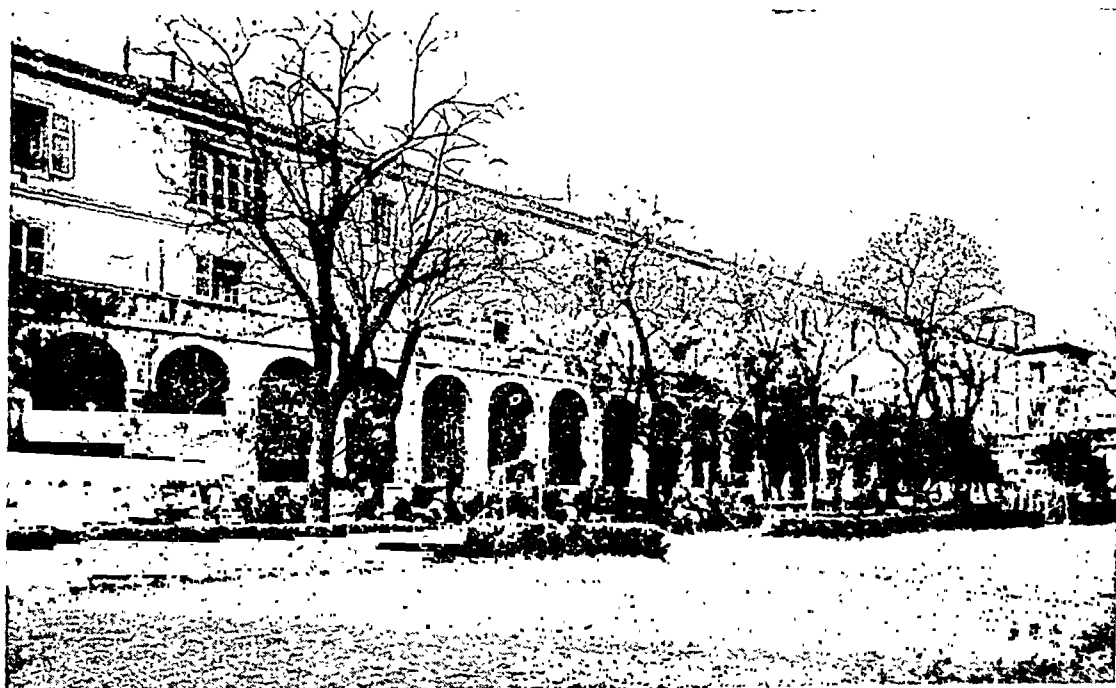


Fig. 3.—The French military hospital at Constantine, in which Laveran's laboratory was situated.

a few remarks and suggested that, just as we had already passed one town this morning rejoicing in the name of "Pasteur," so in time he hoped that this village would be the precursor of a large town which might aptly be called "Sergent." The proceedings terminated

that malaria can have been a very serious problem in Timgad in Roman times.

#### *Biskra.*

Returning via Lambèse we entrained at Batna for Biskra—the oasis on the Sahara—

passing *en route* from the 2,500 to 3,000 ft. plateau of Central Algeria, through the Aurès range by the Gorge of El Kantara and so into the lower lying desert country at the edge of the Great Sahara.

To those, like myself, who were acquainted with tropical and desert countries—more especially those in the Middle East—there was nothing specially novel in the oasis of Biskra, which naturally appealed to the imagination of all the European visitors. It is one of the commercial bottle-necks into central North Africa, and on this account must command interest because of its trade, its bazaar, its inhabitants, its visitors, its situation and its nature. A French military cantonment has been created alongside some Arab villages and an old Turkish Fort inside the oasis, and the place is very evidently under military rule. We were not given much information regarding the incidence of malaria amongst the troops or civil population; but, from conversations which I had with Inspector-General Raynaud—the Civil Director of Health of Algeria—I gathered that malaria was not a very urgent problem. Certainly it cannot be so in the cold winter or in the very hot summer, and there is a very low annual rainfall. Mosquito nets were unnecessary, though the temperature was considerable, and a dust storm persisted during our stay. Sandflies seemed to be abundant, however.\* The Arabs whom one saw were magnificent men. We returned direct from Biskra to Constantine by day, and thence to Algiers by night, arriving on the morning of the 27th.

#### *Institut Pasteur of Algiers.*

On the morning of the 28th, in company with Colonel Christophers, I visited the Pasteur Institut of Algiers and was shown over by the Director-in-Chief—Dr. Edmund Sergent. I met all his staff—his brother, Dr. Etienne Sergent, Dr. Parrot, Dr. Foley, Dr. Catanei and Dr. Senevet.

The Institute, which has a branch in the city of Algiers for treatment, is beautifully situated on the East bay close to the shore and alongside the Jardin d'Essais; and has several hectares of land available for building. It is a long building facing the sea, i.e., North, and the rooms are small, numerous and well suited to their work. There is a good library. Bottling, cleaning, storage, etc., and lymph production are on the ground floor.

The most noticeable difference between this and our institutes is that, in Algiers, the work is not confined to purely medical problems, but deals with animal and plant diseases, and economic conditions generally, thus combining veterinary and agricultural research with medical. The Director thinks this is an advantage.

It is difficult to estimate the volume of work

going on in such an institution; but we certainly saw many different activities during our visit. Colonel Christophers was able also through the courtesy of Dr. Sergent and Dr. Senevet, to examine the anopheline collection in the Institute carefully and in detail.

#### *Conclusions.*

After such a visit, despite its shortness, certain impressions are inevitable.

(i) The Congress was valuable, not so much from the point of view of the material produced as from that of the personal contacts made during it. Names like Nicolle, Sergent, Marchoux, Mesnil, Senevet, became more than paper names.

(ii) The organisation of the Congress left a little to be desired in regard to details, and more especially in regard to the excursions.

(iii) The hospitality of the Government of Algeria was such as one expected it would be from a department of the great French Republic.

(iv) The absence of British communications was too noticeable to pass unrecorded—especially when so much material exists in our Empire.

(v) The "Mitidja" excursion was a wonderful and valuable object lesson of what can be done by close co-operation between agriculture and science under conditions where malaria is ubiquitous.

(vi) The celebrations in memory of Laveran were well organised and worthy of the occasion; and they left a very pleasing impression of the great esteem and honour in which the memory of a "savant," who has benefited a country by his abstract researches, can be held by all classes, both medical and lay.

(vii) The memorial on the Great South Road was a happy thought, which is not absolutely new to the Algerian authorities and has probably been borrowed from Roman examples.

(viii) The great problems of health in Algeria—and also I believe in Tunisia and Oran—are largely those with which those of us in tropical countries like India are familiar. The indigenous races have a high intelligence and are all of one religion, and this has made the application of certain sanitary measures easier than in India. So far as one could judge by the native cities or native quarters of towns, which we were able to see, the local inhabitants are left very largely to themselves, and are not pressed too hard in matters sanitary. The habits of the Arab are much the same all through the Middle East and Africa, and I found Southern Algeria no exception.

(ix) Topographically there is a wonderful resemblance between the plateau region round Constantine and the great plateaux of North Persia, Kurdistan and Northern Iraq; the parallel between Biskra and Basra or Baghdad being equally close. The sanitary problems must therefore be almost the same.

\* Biskra is a hotbed of oriental sore.—EDITOR, I. M. G.



## Medical News.

### LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE.

(DIVISION OF TROPICAL MEDICINE AND HYGIENE.)

Examination Result. 88th Term. February—July 1930.

#### Passed with Distinction.

Cook, A. B. (Winner of "Duncan" Medal).	O'Neill, E. N.
Anderson, T. F.	Roberts, C. R.
Connell, W. K.	Spink, R. G.
McPherson, D. R.	Stewart, D. E.
	Sudds, M. V. N.
	Timbres, H. G.

#### Passed.

Alvarado, C. A.	Murray, D.
Burton, E.	Rao, P. K.
Chance, G. Q.	Shelley, R.
Cowin, P. J.	Soar, H. M.
Dutt, B. P.	Stephens, T. W.
Gaffar, M. A.	Taylor, B. A.
Griffith, D. R.	Taylor, W. F. O.
Khan, L. R.	Theis, S. E.
Kordi, A. H. H. El.	Tullidge, G. M.
Lourie, E. M.	Wallace, H. B. C.
McCay, F. H.	Wijerama, E. M.
Marsh, F.	Willis, W. H.
Maxwell, E. C. W.	Wolfe, E. D. B.
Nolan, T. H.	Wood-Martin, K.

### THE OFFICE INTERNATIONAL D'HYGIENE PUBLIQUE.

We have received, through the courtesy of Major-General J. D. Graham, C.I.E., I.M.S., Public Health Commissioner with the Government of India, a copy of his report to Government on the session of the Office International d'Hygiene Publique held from May 10th to 21st, 1930, in Paris. General Graham attended as official delegate for the Government of India, and presented numerous contributions from workers in India, which were well received. His report is full of interesting matter, and some abstracts from it will be of interest to our readers. M. Velghe presided at the session, and delegates from 38 countries were present.

The Quarantine Committee met on the 10th, 14th, and 15th May, and dealt with a large number of subjects; these included deratisation, the international medical signal code, and the sanitary control of aerial navigation. A new type of certificate of deratisation which has been adopted by Great Britain and the colonies was presented by Sir George Buchanan, whilst it was decided that the creation of fumigation standards should be studied. With regard to ships' doctors, Sir George Buchanan mentioned that there was a possibility that special classes might be held at the London School of Hygiene and Tropical Medicine.

The Haj Pilgrimage Committee met on May 16th, and General Graham presented the report of the Haj Committee appointed by the Government of India in 1929. One of the most important recommendations of this Committee was the compulsory vaccination against small-pox and inoculation against cholera of all pilgrims. It may be necessary to introduce several reforms at Kamaran Quarantine Station. General Graham spoke on the report in general, and circulated copies, with the request that the matter should be further considered at the session in October 1930.

The meetings of the Yellow Fever Committee were important, for discussion centred around the possibility of the introduction of yellow fever into India and the Far Eastern countries by aeroplane. It will be recalled that the Government of India have officially prohibited the importation of yellow fever virus into India, even for purposes of experimental study, and that the Dutch Government has taken the same step for the Dutch

East Indies. Lieut.-Col. S. P. James, I.M.S. (ret'd.), gave a résumé of the whole position, and General Graham brought the resolution of the Singapore Advisory Council of February 1930 to the notice of the Committee.

With regard to plague, General Graham presented a list of the papers on this subject published by research workers in India during the year, 4 in number; showed a chart of plague incidence in India since 1896; and circulated a summary of papers by Lieut.-Col. G. Jolly, I.M.S., Cols. Russell and King with Dr. Pandit, by Major Anderson and Lieut.-Col. Dunn, I.M.S.; and a reprint of an article on a rat flea survey of Madras Presidency.

He then gave details of the work in India during the previous year. In connection with the rat flea survey of Rangoon Port, *X. astia* had been found to outnumber *X. cheopis* throughout the year, February showed the highest flea infestation of rats, but the maximum prevalence of *X. cheopis* was in August, when this species constituted 17 per cent. of the fleas collected. In April 1928 the areas comprising the Sule Pagoda and Latter Street wharves were completely paved in with concrete and the grain stores transferred to the Upper Pazundaung foreshore. This resulted in a great reduction in the rat and flea population. In 1929 two areas—the centre of the town, and the Pazundaung area to the east of the town—were surveyed. In both areas the proportion of *X. cheopis* to *X. astia* was as 25 : 75 per cent.; whereas in the port area, where plague does not occur, the corresponding proportions were 5 : 95 per cent. Certain species of rats always show a heavier flea infestation than do others.

With regard to the rat flea survey in Madras, *X. cheopis* predominated in all the endemic plague areas, except at Hosur, where *X. brasiliensis* predominated. In general, flea indices were highest in the endemic centres. Live fleas were in two instances found in recently imported and stored grain, whilst examples were also found of a selective preference of *X. cheopis* for cotton and rice. The indigenous flea throughout the Madras Presidency is *X. astia*, though *X. cheopis* is a persistent foreign invader. Up to date about 30 places have been surveyed.

Turning to the investigations at the Haffkine Institute, Dr. Naidu has obtained a very efficacious anti-plague serum from immunised rabbits, and is now engaged in trying to produce a similar serum on a large scale from immunised sheep and calves. A rat flea survey of Bombay city has been carried out. *X. brasiliensis* has been definitely proved to be a transmitter under Indian conditions, and one attempt to infect fleas from a dead rat was successful. All three species will feed on man. Father Caius and Dr. Wadia have studied the chemotherapy of plague; it has been found that para-chlor-mercuri-phenol destroys *B. pestis* grown on blood agar, after 24 hours contact, in a dilution of 1 : 400,000,000. Major Sokhey and Dr. LaFrenais have studied the standardisation of plague vaccine. Dr. Goré's "nitrite test" has recently been fully dealt with in our columns.

The plague enquiry in the United Provinces under Dr. Goyle has now been terminated. The evidence goes to show that plague does not persist in a locality apart from infection among the rats, and that in the carry over season the infection is kept alive in a scanty rat population with a scanty flea population during the hot weather.

After General Graham's speech, the President congratulated him and the Government of India on the valuable work being carried out in India on this disease, and the steady diminution of its incidence in India year by year. During the last five years General Graham has been able year by year to present to the Office a continuous account of investigation and progress.

The next item considered was cholera. Here General Graham presented a list of the original articles, 6 in number, published by workers in India in 1929-30; showed a chart of cholera mortality in India from 1877 to 1927; presented a note in résumé form on cholera researches in the U. P., Bihar and Orissa, Assam, Bengal

and Madras; a further note on research work on bacteriophage in this disease; a reprint to each member of a paper on 'phage by Dr. Asheshov and other workers, and a reprint of the editorial on bacteriophage in the *Indian Medical Gazette* for February 1930; also a copy of Col. Russell's report on cholera in the Madras Presidency from 1818 to 1927.

Taking first the enquiry in the United Provinces by Dr. Suranjan Khan, the whole evidence goes to show that there are no "chronic carriers" in the U. P.; and that every epidemic there commences from fresh importation of the infection from the endemic areas. Dr. Tomb and Dr. Sen, working in the mining settlement at Asansol, have come to the same conclusion. Last year the maximum incidence of the disease was in August, instead of being, as usual, in April, and this deviation was due to the frequent ingress of carriers from the adjoining districts, where cholera had been prevalent in severe epidemic form. The carrier condition, both in actual cases of cholera and in contacts, is a temporary one. What is more puzzling is the occasional finding of evanescent infection with agglutinating vibrios in both children and adults, who have apparently had no contact with the disease.

In Assam, Col. Morison has been studying the morphology and serology of cholera strains isolated by different workers in Calcutta, Asansol, the United Provinces, and Assam—74 in all; this investigation is still in progress. In Bengal Dr. B. Brahmachari has continued his work on the relationship of agglutinating to non-agglutinating strains; his conclusion is that Koch's vibrio is capable of losing its agglutinating property soon after its escape from the human body, but its agglutinating power and virulence may be recovered on its return to the human body, or the intestine of a rabbit. In Madras, the collection of statistical information with regard to the disease has been continued, and a paper published.

Turning to bacteriophage here Dr. Asheshov is working at Patna. Col. Taylor at Rangoon, Col. Morison in Assam, Major Malone at Kasauli, and Major Iyengar in the field. Dr. Asheshov's work has recently been outlined in our editorial columns; it is work of a fundamental and basic character on the nature of the 'phage itself, and its properties. His most important finding is that there are three different strains of anti-cholera 'phage, the most potent of which is unfortunately also the most thermolabile; all three strains must be mixed when using 'phage clinically in the treatment of cases. Clinical results at Puri were not good, but the patients were for the most part old men of over 50 years of age, and they reached the hospital in a totally exhausted condition. On the other hand, when the wells in a selected area in the town were treated with 'phage, the incidence of cholera in this area was only a tenth of that in the untreated control area. At Patna Medical College Hospital, when Dr. Asheshov and his staff had the patients under their personal care and control, and measures were taken to sterilise bedpans, etc., the results of treatment with 'phage were eminently successful.

In endemic cholera, with sporadic cases, at Rangoon, however, Col. Taylor's results with bacteriophage have not been good: a mortality of 57 per cent. among the cases treated with 'phage as against one of 53 per cent. among the controls. In acute and sub-acute bacillary dysentery also, results were unfavourable. In Assam the Pasteur Institute at Shillong is now issuing very large quantities of polyvalent bacteriophage throughout the province and to the tea gardens, and good—in some instances excellent—results are reported. Col. Morison has recently detailed these results in our columns in connection with an epidemic in the Khasi hills. The chief causes of failure are the use of Bismuth and of intestinal antiseptics, and non-realisation that the 'phage must be given on an empty, resting stomach.

Major Malone has been investigating the presence or absence of 'phage in well waters and in flies, in villages where there had recently been cholera, and in other control villages which had been free from cholera for

some years; results to date are inconclusive. Major Iyengar is carrying out similar work in the Madras Presidency; he reports that prior to an outbreak of cholera, no bacteriophage can be isolated from wells in the area.

In concluding his remarks on this subject, General Graham spoke as follows:—

"The general results of the discussion at the Calcutta Conference of Research Workers (December 1929) showed that considerable diversity of opinion existed, even amongst our own workers regarding the curative and prophylactic efficacy of bacteriophage in cholera and dysentery. Dr. Asheshov considered that the bacteriophage played a very important part in the epidemiology; but that it was impossible to estimate this meantime, until there was more basic knowledge on the subject. He proposed to direct his attention to this aspect of the enquiry. At the meeting of the Eastern Bureau of the League of Nations, Singapore, held in Java in February 1930, I introduced to the notice of the members of the Advisory Council the work which is being done in India, as it will be remembered that this body is now collecting documentation on the subject."

(A review of the position shows that two of India's most important diseases—cholera and bacillary dysentery—are at present the subject of widespread study and investigation by workers in different centres.)

The next subject considered in full plenary session was yellow fever. Here discussion centred on the possibility of the importation of the infection into India and Far Eastern countries by aeroplane traffic, and there was some discussion on the dangers that might arise with the establishment of the new hydroaeron route from South America to Europe. Several members considered that persons coming from an infected area should be subjected to a six-day quarantine. All were agreed that the experimental study of the disease should be confined to areas where it already existed, and to cold climates where *Aedes aegypti* is absent; and that the importation of the virus for experimental purposes into India and Far Eastern countries should be prohibited. The further discussion of the subject was then postponed until the October 1930 session.

Typhus and allied fevers were then discussed, and General Graham presented a paper by General Megaw, I.M.S., on tick typhus and allied fevers. In connection with the discussion on tuberculosis, the serious position in Algiers and Morocco was dwelt upon by French workers, and the relationship of silicosis to tuberculosis in mining areas was also a subject of discussion. General Graham presented a résumé of the work carried out by Dr. Soparkar at the Haffkine Institute, Parel. Investigation of surgical tuberculosis in India has shown that, with a solitary exception, the infection was always with the human strain. In one instance, however, a bovine strain was isolated, this being the first time that the bovine strain has been isolated from man in India. The Indian cattle are not so absolutely free from tuberculosis as was previously supposed to be the case. Filtrability experiments have given negative results, filtrates from cultures being non-infective to animals, except in one anomalous instance the reason for which it is difficult to suggest. In cattle, immunisation with B. C. G. gave only a weak immunity. In Calcutta Dr. Ukil has studied the types of tubercle bacilli met with, and the part played in pulmonary tuberculosis by secondary bacterial infections. He considers B. C. G. to be completely innocuous, and recommends its use to immunise non-immune people in rural areas before moving them into industrial areas.

Draft regulations for the sanitary control of aerial navigation were next considered, and in this connection General Graham outlined the organisation at the air port of Karachi. After considerable discussion it was decided to prepare an amended draft, and circulate it to all the Governments concerned, for opinion. In the discussion on small-pox, General Graham commented on some difficulties with regard to vaccination certificates, as different Governments demanded different standards. Sir George Buchanan presented a report on post-vaccinal encephalitis, a disease which is at present

the subject of special investigation by the British National Council of Medical Research, and by workers in Holland.

At a later sitting, General Graham gave an outline of the sanitary arrangements at the Kumbh Mela at Allahabad in 1930, illustrated by charts, maps and plans; and, circulated a note written in French dealing with the subject. This was listened to with very great interest, and enquiries were made as to whether copies of the official report by the U. P. Government on the Kumbh Mela arrangements could be made available. The resolutions of the Advisory Council of the Singapore Bureau, dated February 1930, were then discussed.

In summarising his report, General Graham writes as follows:—

"This meeting was important from several points of view. The discussions on yellow fever, especially in relation to aerial traffic; on aerial traffic and its sanitary organisation under the International Sanitary Convention, 1926, and the *avant projet* in this connection; on the working of Article 28, International Sanitary Convention, 1926, especially in relation to deratisation and deratisation exemption certificates; on the election of representatives from the 'Office' to the Health Committee of the League of Nations; on the questions raised by the delegate for British India regarding small-pox and cholera protection, the Haj Pilgrimage Report, and the Singapore Advisory Council's resolutions of 1930; on the commencement of a description of international air ports by a note on that at Drigh Road, Karachi, by the delegate for British India; on plague and cholera; and on the Kumbh Mela at Allahabad; were all subjects of interest and importance. The Indian contributions, which were rather more numerous than usual, were well received. I have been able to discuss with the Director in some detail the arrangements which he considers essential for the translation by the 'Office' of articles and communications for the next meeting, and I hope to be able to meet him in some of his wishes regarding this."

## Current Topics.

### Acetic Acid in the Treatment of Trachoma.

By CONRADO D. AYUYAO, M.D.

(Abstracted from *The Journal of the Philippine Islands Medical Association*, Vol. X, No. 3, March, 1930, p. 129.)

#### *Technique of the Treatment.*

**Medicament.**—Acetic acid, 25 per cent. solution; sodium bicarbonate, 2 per cent. solution; and cocaine, 5 to 10 per cent. solution.

**Instruments.**—Tattooing needles and eyelid forceps.

**Preparation of the patient.**—There is hardly any preoperative preparation of the patient. He is made to lie down on a table with the head near the edge. The eyes are cleansed with soap and water. The conjunctival sac is then flushed with normal saline solution or, better still, with a weak solution of bichloride of mercury (1 : 10,000). One or two drops of cocaine solution are then instilled into the eyes about five minutes before the operation. Adrenalin (1 : 1,000) may be also instilled with advantage. The eyelid, either lower or upper, is everted with the index finger and the thumb and thus held in place. The tattooing needles are dipped in the acetic acid solution and the granules are tattooed with these needles. In the meantime the assistant is continuously dropping solution of sodium bicarbonate into the eye with a medicine dropper, to protect the cornea from the action of the acetic acid. The operation is continued until all the visible granules have been tattooed.

After the operation the patient is instructed to apply cold boric acid compress over the eyelids for one day. After twenty-four hours the tarsal conjunctivæ are again searched for granulations that might have escaped the

notice of the surgeon. These may be touched with the tattooing needles with the acetic acid.

In most of the cases one sitting was enough; in a few cases four sittings were necessary. The number of sittings depends mainly upon the nervousness of the patient. The same procedure is followed at each sitting and treatment is continued until all the granulations have disappeared. This treatment may be applied to any patient, irrespective of sex and age. In fact, most of the cases are children from the primary grades. The youngest of the series was 6 years old and the oldest was 46 years old. It was observed that children above 10 years of age were more tolerant to pain.

After the pricking of the granules, a thick, gelatinous substance exudes and the granules collapse. The tarsal conjunctiva becomes smooth and there is some subconjunctival hæmorrhage. After the first twenty-four hours some ecchymosis of the bulbar conjunctiva is often observed. The eyelids are slightly swollen, but this condition disappears by the second or third day after the operation.

#### *Conclusion.*

In 66 cases the use of acetic acid by the tattooing procedure has given encouraging results. The procedure can be easily carried out and requires less personnel than does ordinary grattage or expression of the granules. Though the treatment is not entirely devoid of pain, yet it can be endured by the most nervous patient, for it can be applied at various sittings. No elaborate operating room is needed, so that it can be carried out in the field as well.

### Recent Advances in the Treatment of Pulmonary Tuberculosis.

By PHILIP ELLMAN, M.D., M.R.C.P.

(Abstracted from *The Practitioner*, Vol. CXXIV, No. 4, April, 1930, p. 459.)

I wish to emphasize the following points:—

(1) That cases for the more recent advances in treatment must be selected judiciously if such valuable forms of treatment are not to fall into disrepute.

(2) That every case of pulmonary tuberculosis should be kept under a short period of observation before the form of treatment is decided upon.

(3) That, with all the recent advances at our disposal, I am convinced that there are comparatively few early cases of pulmonary tubercle that will not respond successfully to strict sanatorium treatment.

**Collapse therapy.**—This more recent advance in the treatment of pulmonary tubercle is unquestionably, in the correct type of case, one of the greatest advances in medical treatment of recent years. There are three essential forms of collapse therapy. These are:—(a) Artificial pneumothorax; (b) phrenic evulsion; and (c) thoracoplasty.

**Artificial pneumothorax.**—This form of treatment is now becoming extremely popular. In selected cases, which have, as a general routine, been under careful observation, excellent results are obtained, especially if combined with sanatorium treatment. The latter treatment, when in conjunction with artificial pneumothorax, need not be quite so prolonged. The following are the indications for artificial pneumothorax treatment:—

(1) Where, in an early case which has been under the routine preliminary observation with a view to sanatorium treatment and where, despite the strictest form of absolute rest the patient runs a temperature at the slightest provocation, artificial pneumothorax treatment is indicated.

(2) In a unilateral case of pulmonary tubercle, where the lesion in the diseased lung is progressing despite the strictest sanatorium treatment.

(3) With repeated hæmoptyses, if one is certain of the diseased lung responsible, artificial pneumothorax is indicated, if necessary, as an emergency treatment.

(4) In certain persistent cases of tuberculous pleurisy with effusion, a gas replacement is very successful.

(5) In the chronic fibrotic type of case, with existing or threatened bronchiectasis.

Contra-indications to this form of treatment include cases with tuberculous enteritis, cardiac or renal failure, asthma, emphysema in the opposite lung, and individuals of a highly nervous temperament, who will dread every refill. Summing up, artificial pneumothorax treatment, under the circumstances outlined, as an adjunct to the treatment of pulmonary tuberculosis, is one of the greatest instruments for good at the present time; but it must be remembered, in view of our conception of pulmonary tuberculosis, that it is not a substitute for general routine treatment at a sanatorium.

**Phrenic evulsion.**—This operation, which is a comparatively simple procedure and done under local anesthesia, serves to paralyze one dome of the diaphragm, thereby inducing a basal collapse. It may be done as an independent form of treatment or as a preliminary to thoracoplasty. It is particularly valuable in basal tuberculosis and as an aid to artificial pneumothorax treatment to check the recurrence of effusions, and not infrequently it has been found that the length of the intervals of refill can be much increased as a result of paralysis of the diaphragm. As a preliminary form of treatment to thoracoplasty, it not infrequently happens that following this minor operation the condition has so much improved that the larger operation has been found to be unnecessary.

**Thoracoplasty.**—This major operation cannot be undertaken lightly, and should only be done by surgeons with special experience of surgery in relation to diseases of the chest. The operation may be performed in one or two stages.

The indications for thoracoplasty are fairly well defined. In the first place, the disease should be unilateral. The most suitable type of case is generally assumed to be the unilateral case of fibroid tubercle with cavitation and bronchiectasis, where adhesions are so numerous that artificial pneumothorax treatment is quite impossible. Where an artificial pneumothorax is attempted and where, because of adhesions which are too numerous for cauterization through a thoracoscope the pneumothorax cannot be continued, then a thoracoplasty, other things being equal, should be considered. The contra-indications are heart and renal failure, tuberculous enteritis, diabetes, and advanced tuberculous laryngitis affecting the epiglottis. A fairly good general condition, free from gross systemic disturbance is essential. Early tuberculous laryngitis is, as with pneumothorax, no contra-indication to treatment—in fact, the lesion in the larynx is not infrequently benefited.

The great advantage of a thoracoplasty is the permanency of the collapse and the freedom from the necessity of refills; but it must be remembered, on the other hand, that a pneumothorax is a comparatively simple procedure and that the collapse is not necessarily permanent. There can be no doubt, however, from some of the results one has seen of thoracoplasty, that it has a distinct position as a mode of treatment of pulmonary tuberculosis. Given the carefully selected case and the surgeon who is familiar with this branch of surgery, the result can be very striking.

**Cauterization of adhesions.**—A brief reference must be made to this procedure, which has made artificial pneumothorax treatment more possible. We owe the possibility of this procedure to Professor Jacobaeus, of Sweden, who through his thoracoscope has made the cauterization of adhesions a comparatively simple procedure. The instrument is similar to the cystoscope, and by local anesthesia it is introduced into the pleural cavity, the adhesions being viewed through the thoracoscope before cauterization.

**Sanoerysin.**—From their experiences with sanoerysin, observers like Burrell in England, and Gravesen in Denmark, who have had considerable experience of the

drug as an aid to treatment, are of the general opinion that sanoerysin should be used essentially where there is a fresh area of spreading disease—what is more frequently referred to on the continent as the exudative type of disease, as opposed to the chronic fibrotic type of disease. There can be no doubt that the indiscriminate use of sanoerysin does harm, but that in carefully selected cases, a favourable response can be obtained.

A course of treatment with sanoerysin usually lasts from 5 to 6 weeks. The beginning doses for an adult should be somewhat as follows: at intervals of three days, providing there is no reaction, 0.05, 0.1, and 0.25 gram. If there is a reaction, wait until this has subsided and then repeat the same or the dose previous to the one producing the reaction. At weekly intervals, under the conditions just outlined, give 0.4, 0.6, 0.75 or 0.85 gram, and if the patient is in really good condition, even 1 gram may be given. Under such a routine, provided that the patient is showing a favourable response there is a striking diminution in the quantity of sputum and the number of tubercle bacilli, a positive sputum often becoming negative. With severe febrile reactions, gastro-intestinal disturbance, marked and persistent albuminuria and always with dermatitis, the treatment should be discontinued. He also states that sanoerysin is well tolerated by children. The amount of sanoerysin given in one course of treatment for an adult is 5 to 6 grams, and the final dose may be repeated until the 5 or 6 grams has been given.

**Calcium and parathyroid therapy.**—During 1926-1927, while in the tuberculosis service of the Metropolitan Asylums Board, I carried out some investigations on the correlation of calcium metabolism, parathyroid function and pulmonary tuberculosis. My experiences led me to believe that calcium therapy alone or aided by extract of parathyroid, given over a sufficiently long period, did promote calcium retention, especially in the decalcified type of case where the blood-calcium level—which, although I always found to be within normal limits (9 to 12 mgms. per 100 c.cm.)—could be raised from its normal minimum to normal maximum concentration point with correspondingly good results. In a few febrile cases, which had proved resistant to other methods, I found that a course of six intravenous injections of 5 c.cm. of a 10 per cent. solution of calcium chloride produced an amazing improvement in the general condition, rendering a positive sputum negative as with sanoerysin.

## Kala-azar Infection as a Biological Method of Blocking the Reticulo-Endothelial System.

By T. J. KUROTCHKIN, M.D.,  
and

H. L. CHUNG, M.D.

(Abstracted from *The National Medical Journal of China*, Vol. XVI, No. 1, February, 1930, p. 43.)

### DISCUSSION AND SUMMARY.

In these experiments it was attempted to study whether or not the reticulo-endothelial system can be considered as a site of antibody production. For this purpose a biological method of blocking the reticulo-endothelial cells was applied. The method is based upon the fact that in kala-azar infection of hamsters the distribution of the parasites is to a great extent among the reticulo-endothelial cells. Theoretically it may be expected that when blockage of the reticulo-endothelial cells is based upon the mutual affinity of the cells and the blocking material, a complete suppression of the functional activity of the cells will occur. In our work we tested hamsters infected with kala-azar for their capacity to produce agglutinins against two species of bacteria, namely, *B. typhosus* and *B. proteus*. It was found that kala-azar hamsters respond to immunization with bacterial antigens in a remarkably different way from that observed in normal hamsters. While

normal hamsters produce appreciable amount of agglutinins, kala-azar hamsters yield sera which were extremely poor in this immune body.

In order to determine the possibility of blocking the reticulo-endothelial cells in hamsters by mechanical means, different series of these animals were treated with trypan blue and electroferrol, following which they were immunized with bacterial antigens. It was possible by this method to secure considerable suppression of the agglutinin production. The experiment offers substantial evidence that in the case of kala-azar the absence of agglutinins against injected bacteria is due to the blocking of the reticulo-endothelial system.

It has been also observed that while normal hamsters readily tolerate the injection of killed bacterial vaccine, kala-azar hamsters as well as those blocked with trypan blue or electroferrol, with or without preliminary splenectomy, exhibit diminished resistance, being frequently killed by the dose of vaccine which is harmless for a normal animal.

### The Aetiology of Tick-bite Fever.

By ADRIANUS PIJPER, M.D.,  
and  
HELEN DAU.

(Abstracted from *The Journ. Trop. Med. Hyg.*,  
Vol. XXXIII, No. 7, April 1st, 1930, p. 93.)

TICK-BITE fever is the name given in many parts of South Africa to an acute fever which follows the bite of a tick. The disease must not be confused with tick fever or relapsing fever, or with tick paralysis, as it has nothing to do with either of these affections. Tick-bite fever is quite a separate and distinct clinical and pathological entity. The disease has various other names in different parts of the country. Such names usually refer to the neighbourhood in which the affection occurs, such as Pretoria ten days' fever, Natal fever, and so on. It is often erroneously regarded as paratyphoid. We suggest that the name of tick-bite fever, which is comprehensive and expressive, should be generally adopted.

The bite of the tick gives rise to a typical primary sore, followed by a lymphangitis and swelling of the regional lymph-glands. Apart from this, the disease, during its course and symptoms, resembles mild typhus. The primary sore is very similar to that described in pseudotyphus by Schüffner (1915) and by Maasland (1926), since the whole disease closely resembles in its clinical features the affection described by these authors.

Other diseases showing important points of resemblance from the clinical point of view are: Rocky Mountain spotted fever, tropical typhus of Malaya (Fletcher, Lesslar and Lewthwaite), and tsutsugamushi or kedani disease of Japan. As we are only concerned here with the aetiology of tick-bite fever, this superficial survey of the clinical aspects must suffice. One important point, however, must still be mentioned, namely, that tick-bite fever always is a mild disease and never fatal. Efforts to clear up the aetiology of this disease have up till now failed (Brumpt, 1927).

We have examined some dozens of cases during the last few years by the usual methods (blood-cultures, stained blood-smears, centrifuging blood for the concentration of parasites, dark field examination of blood, examination of scraping from sores, stools, and urines) without making much headway. We have tried agglutination reactions in all our cases with patients' serum. We used live suspensions of *B. proteus* X 19, X 2, and the Kingsbury strain. These three strains we owe to the kindness of Dr. Felix of the Lister Institute. Lately we have also tried *B. agglutinabilis*, which its discoverer, Professor Wilson of Belfast, kindly sent us (Wilson, 1927). In a few cases only a positive reaction was obtained with any one of these strains at a titre of 1:100. We have, however, only quite recently

discovered that the best results are achieved during convalescence, and nearly all cases have since been tested whilst they had fever.

We have often observed that intraperitoneal inoculation of guinea-pigs with blood taken from a patient during the height of fever produces some effect. The inoculation is followed by changes in the temperature-curve extending over several weeks. The deviation from the normal is usually not more than one degree Celsius. Still, as we possess careful temperature-records of these animals for several weeks previously to the inoculation, even such small changes are significant.

The inoculated animals never died, and only showed slight signs of illness. Some of them we have killed two or three weeks after inoculation. The more important findings at the post-mortems were: enlarged spleen, enlarged suprarenals, often some enlarged inguinal lymph-glands, and sometimes small hæmorrhages in serous membranes.

In blood-smears from our inoculated animals we have often found, but not without searching for them, in large mononuclears and in lymphocytes, small bodies which we thought we could differentiate from Kurloff bodies. We suspected them to be rickettsiæ. Similar bodies have also been seen by us in the corresponding white cells of blood-smears from patients. Control examinations of normal guinea-pigs and normal persons were always negative in this respect.

Sections through the enlarged guinea-pig organs mentioned above, stained with Giemsa's stain, gave similar findings and often definitely suggested the presence of rickettsiæ. We did not, however, feel justified in calling these bodies definitely rickettsiæ, as they were so few in number and errors are so often met with under such circumstances. Topley and Wilson (1929) sum up the position in such cases very aptly in the following words: "When very few in number, rickettsiæ cannot be recognized with certainty, since their resemblance to minute particles of detritus is too close; but when they are present in large numbers, their recognition is comparatively easy."

Recently we have examined the brain of inoculated guinea-pigs, although it does not show macroscopic changes. We then discovered that the brain provided the solution of the problem of the aetiology. We have found that when a guinea-pig is inoculated intraperitoneally with about 2 c.c. fresh blood from a patient at the height of his fever, very definite rickettsiæ develop in the brain of the animal. When the animal is killed about eighteen days after inoculation, sections through the brain, fixed in Zenker's fluid, embedded in paraffin, and stained with Giemsa's stain, show:—

(1) Fairly numerous "nodules" resembling the well-known "typhus nodules." They can be easily found with a low magnification. Upon closer examination it is seen to be situated round a capillary blood-vessel. The capillary is often destroyed, and then remnants only of its wall can be detected. Histologically the nodule consists of a collection of lymphocytes and mononuclear cells, probably derived from the endothelium. On an average five or six such nodules were found in one section of a brain, cut lengthwise.

(2) These nodules are infiltrated with small bodies. The small bodies are scattered all over the nodules, but they are somewhat more concentrated round the cells which constitute the nodule.

These small bodies possess all the characteristics of rickettsiæ. Most of them measure from 0.3 to 0.5 micron. They are not uniform in size. They are very pleomorphic. They often show diploid forms. Many are apparently surrounded by a halo. They stain purple with Giemsa's stain. Black and white photography does not do them justice. To the experienced eye, under the microscope they are unmistakably rickettsiæ. The nodules always contain the rickettsiæ in large numbers, and we have not found them anywhere else in sections of the brain. In control animals we have failed to find either nodules or similar small bodies. For these reasons we claim that the problem of the aetiology of tick-bite fever is solved.



Our findings bring tick-bite fever into line with typhus and Rocky Mountain spotted fever, the other two human diseases in which rickettsia have been demonstrated as the cause. Its clinical affinities to these two diseases have been commented on above. The intracellular habitat of the rickettsia of typhus is regarded as rather characteristic for this species of rickettsia (Wolbach and Todd, 1922; Wolbach, 1925). In Rocky Mountain spotted fever this feature does not seem to be so pronounced (Wolbach and Todd, 1920). Although many of the rickettsia we have found in our nodules are intracellular, most of them are not. This feature may serve to distinguish them from others. Perhaps they may be more definitely intracellular in earlier stages of their development than we have witnessed so far. Our investigations are being continued in these and other directions (Kuczynski, 1927; Anigstein and Amzel, 1930).

### Tropical Fevers of Short Duration.

By LIEUT.-COL. W. P. MACARTHUR, D.S.O., O.B.E.,  
M.D., F.R.C.P.I.,

SURGN.-COMDR. S. F. DUDLEY, O.B.E., M.D., D.F.H., R.N.,  
and

WING-COMMANDER H. E. WHITTINGHAM, R.A.F.

(Abstracted from *The Journal of the Royal Naval Medical Service*, Vol. XVI, No. 2, April, 1930, p. 113.)

#### Conclusions.

DISEASES may be indefinite, because they are atypical examples of well-known infections, or because they are separate clinical entities that still await full description. The first class include mild or abortive cases of such conditions as typhoid, paratyphoid and undulant fever. Malaria frequently shows a low continued fever, the paroxysms being absent and the parasites so scanty in the blood as to be easily overlooked. Abortive heat stroke may also account for some ill-defined febrile attacks, in children, and after heavy exercise, in hot climates. Dengue and phlebotomus fever are recognized as definite clinical entities, but owing to their lack of definite symptoms are frequently confused with similar syndromes. Especially is this the case with influenza, which is very common in the tropics, but rarely accompanied by nasal catarrh. The blood-pictures of dengue and sandfly fever are often not sufficiently distinct from that of influenza to separate, with any certainty, these diseases. Recently spirochaetosis as a cause of short fever has attracted attention. The leptospira as a group show many variants, which although indistinguishable morphologically, yet seem able to cause clinical symptoms which vary from a day or two of pyrexia accompanied by injected conjunctiva, and a trace of albumin in the urine, up to a severe toxæmic jaundice. Weil's disease has probably at times been recorded as dengue. The more severe forms of dengue and sandfly fever should, however, be distinguished from spirochaetosis by their respective blood-pictures. Weil's disease, in its turn, can generally be distinguished from yellow fever by the relative quantities of albumin in the urine. If a urine boils solid, the diagnosis is yellow fever; if there is only a trace of albumin, Weil's disease. The attempts which are being made to distinguish and describe indefinite short fevers are handicapped, and the confusion increased, by the habit which exists in some quarters of labelling cases, in which the diagnosis is really unknown, with a definite name, for the sake of hospital records. If a case, in spite of all possible investigation, remains a "pyrexia of unknown origin" it must be honestly left as such in all sick returns.

### An Anniversary Year.

A NOTE from a correspondent points out to us that 1930 is the 25th anniversary year of three very important discoveries in Medicine. It was in 1905 that the spirochæte of syphilis was discovered by Schaudinn; the

spirochæte of yaws was discovered by Castellani in the same year; whilst in 1905 also there appeared a very important paper by Thomas and Breinl from the Liverpool School of Tropical Medicine on the successful use of atoxyl in the treatment of trypanosomiasis—a paper which led to Ehrlich's researches into the arsenical derivatives in spirochaetal infections, the discovery first of salvarsan, later of neosalvarsan, and other organic arsenicals.

It would be of very considerable interest if some correspondent could find the time to write a précis of the developments in the treatment of spirochaetal infections during the quarter of a century which has since elapsed.

### Transmission of Fowl-pox by Mosquitoes : Further Observations.

By I. J. KLIGLER,

and

M. ASHNER.

(Abstracted from *Bulletin of Hygiene*, Vol. V, No. 4, April, 1930, p. 278.)

MOSQUITOES (*Culex pipiens* and *Aedes aegypti*, bred in the laboratory) were allowed to feed on the comb and wattles of a chicken infected with fowl-pox, and 2 or 3 days afterwards were allowed to feed on the comb and wattles of a normal chicken. In the majority of cases characteristic lesions appeared at the point of feeding 12 to 14 days after the mosquitoes had fed. In another series, infected mosquitoes were allowed to feed on normal chickens 3 and 8 days after infection, having, in the interval between the two feeds, been fed once on a normal guinea-pig. The 3 and 8-day feedings both gave rise to typical lesions.

Serification experiments with various portions of infected mosquitoes, proboscis, thorax, abdomen, etc., indicated that the virus survives on the proboscis, but is seldom present elsewhere. In this situation the virus may retain its activity for 16 to 19 days. There is no evidence that it undergoes any development within the mosquito, which appears to play the part of a mechanical vector of infection.

### Arteriography.

(Abstracted from *Edinburgh Medical Journal*, Vol. XXXVII, No. 6, June, 1930, p. 372.)

THE advantages of arteriography are illustrated in the case of a man aged 24 years reported by Gaudier of Lille. The individual had suffered from a severe contusion of the left foot, which though it only showed superficial excoriation was swollen, cold and purple. The foot was carefully cleaned and dressed. On the third day there was superficial sloughing on the great and index toes and on the back of the foot. The foot continued ecchymosed and was always cold. There was a general rise of temperature while the blood pressure of the injured leg remained negative. Amputation appeared inevitable, but before deciding the site of operation, arteriography by the injection into the femoral artery in the femoral triangle of 10 c.c.m. of a 25 per cent. solution of sodium iodide was carried out under general anaesthesia. A radiogram was taken during the administration and showed the vessels of the leg and foot patent and of a good size, and only the circulation of the terminal vascular network interfered with. Under these circumstances it was decided not to operate, and the event amply justified this decision. An interesting fact was that the operation was followed by much dilatation of the femoral artery and its distal branches, just as after a periarterial sympathectomy, and the blood pressure in the injured leg taken two days later was definitely positive though still less than that of the sound leg.



### Some Aspects of Iodine Therapy.

By W. MITCHELL STEVENS, M.D., F.R.C.P. (Lond.).  
(Abstracted from *The Lancet*, Vol. CCXVIII, June 7th, 1930, p. 1235.)

For many years I have been studying the uses of iodine (as iodides) in arterial affections such as aneurysm, arterio-sclerosis, high arterial blood pressure, and other related conditions, whether such be of syphilitic or other origin, or merely the accompaniment of what is termed "senility." I am confident that the exhibition of iodides may prevent or retard arterial changes and arrest them, when present, for shorter or longer periods, and that the doses required for various purposes vary from very small, even minute, quantities to large amounts, and that no ill-effects whatever occur from the drug itself when judiciously given.

I regard the arterial changes occurring in what is called "old age" to be similar in kind to the changes due to other causes. It appears that senility is, in one sense, a disease and, doubtless, an inevitable one if a person survives long enough, so to speak, but I am inclined to think that, as far as the arteries are concerned, it is a deficiency manifestation or, in other words, that some substance normally present in the blood which defends the arteries becomes deficient either in quantity or quality or both, and that this deficiency may be the expression of a defect in what may be broadly called iodine metabolism, and that it may be corrected, at least for a time, by giving iodine, even in minute doses, bearing in mind the remarkable selective absorption shown for this element where needed.

Iodine is present in all plants and animals, and may be this extraordinary element will come to be recognised as the harmoniser of the hormones. I visualise the day when the duration of life of a considerable proportion of the human race may be extended, and when distressing heart affections not due to what may be called external agencies may be far less prevalent than they are at the present time.

### Observations on Asthma: Results of Treatment.

By D. M. LYON, M.D., D.Sc., F.R.C.P. (Ed.),  
and

R. M. MURRAY-LYON, M.D., M.R.C.P. (Ed.).

(Abstracted from *Brit. Med. Journ.*, May 31st, 1930, p. 987.)

GENERAL impressions gained from clinical experience, though sufficient for the individual observer, should be confirmed by definite evidence whenever possible. A series of nearly 500 cases of asthma examined in the Royal Infirmary of Edinburgh seemed to offer an opportunity of obtaining information regarding the course of the disease and of the results which may be expected from treatment. The patients were all recommended to the hospital by their own doctors as cases of "asthma." The majority of them were examined as out-patients, while a proportion of the more severe cases were treated in the wards for a time. A diagnosis of "asthma" was based on the finding of the patient's own doctor, and on an examination of the individual and a careful history of his illness. Cases of dyspnoea dependent on obvious cardiac or renal disease have not been included. On the other hand, patients with marked bronchitis have only been accepted as asthmatic when a definite account of paroxysmal attacks of dyspnoea was forthcoming. Exception may be taken to the inclusion of cases which have developed asthmatic symptoms only after a long history of chronic bronchitis, but it has been found impossible to draw a hard-and-fast line. There is a tendency on the part of medical writers at the present time to regard "true" asthma solely as a manifestation of the allergic syndrome and to set aside, as not being asthma, cases in which the presence of allergy could not be proved. True asthma, then, would include those cases which show a positive

inheritance of asthma, hay fever, or one of the other exudative diseases, and those in which sensitiveness to some protein can be demonstrated, while patients who only develop asthmatic symptoms after severe or repeated attacks of bronchitis are merely regarded as "asthmatic bronchitis." It has not been possible for us to make such a distinction on account of the large part which respiratory disorders play at the onset of true asthma even in early life; in addition, evidence of constitutional predisposition is often found in cases of late development. All our cases have therefore been taken together as examples of the asthmatic syndrome.

The Edinburgh inquiry has now been in progress for about nine years, a steady stream of patients coming for examination and advice at all seasons. As an estimate of the value of treatment can be made only after a sufficient interval, it has been decided to leave out of this survey all patients seen for the first time within the past twelve months. This leaves a total of 379 patients about whom we have endeavoured to obtain information. The short, simple questionnaire employed has been completed in some cases by the sufferers themselves, in others by their medical attendants. Many of the patients have recently reported in person, giving us an opportunity of obtaining more detailed information. For various reasons it has been impossible to trace 88 of the patients, chiefly because of change of residence, which appears to be more frequent than has been suspected. Replies concerning 291 patients have been received. These records reveal that 36 patients have died; 63 state that their asthma is still as bad as ever; the remaining 192 have derived benefit from treatment. These may be divided into four classes according to the degree of improvement. No fewer than 63 claim to have been "cured," by which is meant that they now enjoy complete freedom from attacks. Some of them have been in good health for years. Those "improved" but not cured number 129. Very great improvement is recorded by 60 patients, many of whom have now only occasional attacks, and these usually mild in character. The third class—those much improved—contains 57 individuals, while only 12 record their improvement as slight. It will thus be seen that a large proportion of the asthmatics still living have received substantial benefit from treatment. The "improved" and "cured" together total 66 per cent. of the whole. Reports concerning those now dead show that some in this group had improved or were free of asthma for a time before death, and that they died from some other condition unconnected with asthma.

While these results are highly encouraging, it is clear that no definite improvement can be guaranteed to an individual sufferer. Many cases are readily amenable to treatment; others appear to be quite resistant, and superficially it is not obvious why this should be so. These differences in the results obtained stimulate inquiry into the factors which lead to them. The points of importance in this connection appear to be: (a) the form of treatment employed; (b) the age at which symptoms originally appeared; (c) the duration of the asthma before satisfactory treatment is begun; (d) the patient's age when first seen; and the questions of (e) heredity; (f) sensitization; and (g) the relation to respiratory infections. Attempts to classify patients according to the severity of the disease have not been successful. The gravity of the condition is difficult to assess for statistical purposes. Patients vary so greatly in their estimates of what constitutes a severe or a mild attack, and the frequency of asthmatic paroxysms is often so variable throughout the seasons, that comparison of one case with another is almost impossible. The physical condition of the patient and the presence or absence of other disease also have considerable influence upon the ultimate result, but the information recorded on these questions is not sufficient to enable an analysis to be made.

#### Relation of Treatment Employed to the Results Obtained.

Since asthma is such a variable disorder, and individual cases differ so greatly, it is impossible to lay down a

uniform plan of treatment for all types. Patients must be treated individually. The clinical examination usually indicated what lines of therapy would be most successful, and an appropriate scheme was drawn up for the patient. Instructions regarding general hygienic measures, alterations of diet, avoidance of late meals, attention to the bowels, and so forth, were given at the time of the examination. The principal treatment was, in many instances, carried out under the supervision of the patient's own doctor. Those who suffer from such a chronic and distressing malady as this are apt to become dissatisfied with one line of treatment and try one remedy after another. Where information on this point has appeared of importance it has been included in our analysis. The figures for treatment have been compiled from the patients' answers to the questionnaire, checked and supplemented from our records.

The recognition of a specific causal agent and its removal or avoidance is clearly the most satisfactory line of treatment when it is applicable. Sometimes the matter is extremely simple and a relatively slight modification makes all the difference. Such minor adjustments are apparently not considered of importance by the patients, for they are seldom mentioned in the returns. Avoidance of an irritant plant or removal of a domestic pet can easily be arranged, but when the irritation arises from some common protein which cannot readily be eliminated, recourse may be had to specific desensitization. Such specific irritants have not been numerous in this series, but the results of their removal have been striking. In the majority of cases in which elimination has been practised the patients have been completely relieved of symptoms.

The importance of environment in aggravating or in relieving symptoms of asthma is well recognized by the general public, and many of our patients (86) have sought relief in a change. Rather more than half of this group found their condition to be just as bad in their new surroundings; two patients believed that they became definitely worse; but 45 per cent. of those who changed their residence claimed improvement thereby. A few asthmatics claimed that they had obtained complete relief from symptoms as the result of changing their surroundings.

Examination of the nose and throat has been carried out in the majority of the patients (252). Most of the subjects were found to show some abnormality, though not necessarily severe enough to require treatment. While remarkable cures may occur after nasal operations, experience shows that such results are exceptional, and caution is necessary in recommending this class of treatment. It is safer never to suggest an operation as a cure for asthma, but only to recommend it when it appears desirable for other reasons—for example, to remove a definite obstruction or to lessen a tendency to recurrent catarrh. In spite of this conservative attitude, 115 patients have been operated on. The operations include 67 for tonsils and adenoids, 18 for polypi, 24 for turbinectomy, 14 for submucous resection, and, in addition, cauterization has been carried out when considered desirable. These procedures undoubtedly benefited the patients by removing irritation or sepsis and by giving a freer airway, and so have contributed to the general results of treatment. Our figures do not show this very clearly. Of patients upon whom operations were performed 18.3 per cent. are returned as cured, in contrast to 29.4 per cent. of cures among those who had no operation. When the "cured" and "improved" are taken together the position is reversed, the figures 66.9 per cent. and 63.2 per cent. showing a small advantage in favour of those who had undergone operation.

Since respiratory infections play so large a part in relation to asthma, either as causal agents or as secondary complications, their treatment including avoidance of prophylaxis is of great importance. Where this factor seemed to be prominent, the patient was given a course of autogenous vaccine made from a laryngeal swab. The results of this treatment have been most gratifying. Patients have not only suffered less from colds, but after the course of vaccines have

often had complete freedom from asthma for some time, or no further return of symptoms. It is significant that the proportion of cured and improved patients who received vaccine treatment is distinctly higher than that of the unfavourable groups. A few of the more resistant cases have undergone treatment by diathermy, ultra-violet radiation, or by x-rays, with apparent benefit.

Probably all the patients at some time or other have received drug treatment, yet only half of the returns (153) include this item. The figures given in the table for each group form an interesting commentary on the value of drugs as curative agents, favourable cases showing less than the others. This may be merely that, having failed to benefit from other measures, the unresponsive patients have had greater opportunity for trying such remedies. Though it is interesting to find that the patients who were cured received less drug treatment and a higher proportion of vaccines, and that the position with regard to patients who were not cured is reversed, too much weight must not be given to these figures, since they also reflect to some extent the types of case dealt with.

#### *Age at Onset.*

The average age at onset of the asthmatic symptoms is much the same in all the groups, except the fatal cases, which have a much higher age-incidence. It is found that in about a third of all the cases (35.4 per cent.) the onset occurs in the first decade. Taking the patients who began to suffer in the first five years of life it will be found that the number "cured" is somewhat low, while the proportion of "unchanged" is relatively high. These differences do not hold for the second quinquennium, nor up to middle life, but a large proportion of the cases commencing after the age of 40 are also unfavourable; 66 per cent. of those who became asthmatic late in life are in the two lower categories. From these observations it would seem that the prognosis is not so good in cases commencing in the first five years, or after middle life.

#### *Duration of Asthma before Treatment.*

The length of the illness before the patient came to the clinic has varied greatly. While most of the patients had suffered for a short time only, some had had the disease for a longer period, and 10 had been asthmatic for over thirty years. Of all cases of less than five years' standing when first seen, no less than 32.6 per cent. were cured, while the percentage "unchanged" numbered only 14.0 per cent. These figures may be compared with the proportion that the "cured" and the "unchanged" bear to the whole series, which is 21.6 per cent. in each case. Cases of longer than five years' duration naturally show a smaller proportion of "cures." The same point is illustrated also by the average duration of the illness in each group—the figure for the "cured" being 7.3 years, in contrast to 10.6 years for each of the "improved" and "unchanged," and 10 years for those who died. These figures indicate the importance of prompt and efficient treatment, and show that the earlier the case is attended to the better the result. The outlook is by no means hopeless, however, in cases of longer duration, for of the ten who had suffered for upwards of thirty years one was returned as cured and five as improved.

#### *Age at Examination.*

The ages of patients when first seen ranged from earliest years up to 70. The numbers for the first ten years are probably unduly low, since many of the younger patients are dealt with elsewhere. In the succeeding age periods, the values for the groups other than the dead decline fairly uniformly. The "unchanged" group shows a slight excess between the ages of 20 and 30, and again after 50. The age when the patient commenced treatment is in itself probably of little importance when allowance is made for the age at first onset of the disease and for the length of time it has been in existence.

*Relation to Aetiological Factors.*

**Heredity.**—The occurrence of asthma in one or more of the near relatives of the patients has been taken for our purpose as evidence of a positive inheritance. Such an association has been found in 37.3 per cent. of all the cases in the present series. It should be noted that although a definite inheritance is more common in those patients who begin to have symptoms in the first ten years of life (about 1 in every 2 patients), there is a fairly uniform proportion of positives in each succeeding period (1 in 3 patients). From the table it will be seen that the figures for the cured and for the dead are distinctly lower than those for the other groups. If the occurrence of skin lesions among relatives is also included as evidence of an "exudative" heredity, the figures become even more definite. The percentage of positives for the whole series now becomes 41.0 and for the various groups: "cured" 31.7, "improved" 42.2, "unchanged" 48.4, dead 31.5. An attempt has been made to gauge the constitutional element by grouping the patients according to the number of the following factors which they show: asthma heredity, the occurrence of skin lesions among relatives, and the presence of hay fever, skin rashes, or protein sensitiveness in the patient. It is found that those subjects with the greater evidence of allergy begin to have symptoms earlier in life. From this it would appear that asthmatics having a positive heredity are somewhat less amenable to treatment, and that the less favourable results for the first five years of life might be explained by the greater proportion of hereditary cases commencing at this period.

**Protein sensitivity.**—From a statistical point of view it is unfortunate that all the subjects have not been exposed to the same set of proteins. Owing to the large number of individual test substances available, it was not at first found possible to employ them all on each patient, and the choice was mainly guided by the history of the case. Later, the plan of testing every subject with a comprehensive series of "grouped" proteins has been adopted. The figures obtained, therefore, do not necessarily represent the true extent of sensitization, but merely the positive reactions found. The "positives" recorded include multiple sensitivity as well as single specific responses. The groups give a similar proportion of positive results, except that the figure for fatal cases is a little low. It should be observed, however, that in the case of the "cured" patients about half of the positives reacted to a single protein.

**Respiratory catarrhs and infections.**—These appear to be of great importance in the development of the asthmatic condition at all ages. It is sometimes said that in early life the exudative diathesis manifests itself by respiratory symptoms indistinguishable from bronchitis. After middle life a history of prolonged or severe bronchitis is more commonly found as a forerunner of the asthma. The patients, when examined, were merely asked whether such conditions were present at the time of, or immediately before, the first attack of asthma, and no account has been taken of previous health in regard to respiratory disorders. The proportion of individuals who give this history is high, and is much the same in each group. There is really no significant difference between the groups in this respect, and this factor does not appear to influence the result of treatment.

\* *Fatal Cases.*

This group stands out from the others in various respects. Inheritance and protein sensitization are rather lower in this class, while respiratory infections are much the same as in the others. The average age of onset in the group is considerably higher—namely, 34.4 years, as contrasted with 21.5, 17.5, and 20.4 for the others. While 7 cases began before the age of 20, a large percentage of this group developed symptoms after middle life. A number of deaths is to be expected in such a group, but the proportion actually recorded is very much greater than would occur in a similar age sample of the community during the same length

of time. Of the 36 deaths, 28 occurred in subjects over the age of 40, 3 were under 20 years of age, and 5 between 20 and 40. Acute illnesses accounted for at least 8 of the deaths; these were influenza (patients aged 7, 14, 48, 55); pneumonia (aged 17); cholecystitis (54); meningitis (40); gastric hæmorrhage (39). There were two suicides (50 and 61). Two fatalities were due to phthisis (26 and 32), both patients having previously had undoubted asthmatic symptoms. Syphilis accounted for 4 deaths (36, 60, 60, and 70) and cerebral hæmorrhage for one (51). Five were attributed to heart failure (36, 43, 58, 63, and 70). In the case of the remaining 14 the exact cause of death has not been ascertained. These include some of the most severe cases, in which the patients are known to have been almost constantly dyspnoeic and in a condition of status asthmaticus with advanced emphysema and cardiac embarrassment. Additional information shows that before death 2 of the patients had been "cured" of their asthma, 7 were considerably improved, 2 slightly benefited, and 15 were unchanged. These figures have not been incorporated in the other sections.

*Summary.*

The results of treatment in 291 cases of asthma are reported. Of these, 66 per cent. have been benefited and 12.4 per cent. have died. No single scheme of treatment can be laid down for all cases; each patient must be treated individually. The most successful forms of therapy appear to be elimination when applicable, and vaccine treatment where respiratory infections complicate the asthma. Cases which react to a single protein are usually favourable, but the occurrence of multiple sensitivity is of little importance in relation to treatment. Among many factors less easy to assess, change of residence and general hygienic measures have contributed to the patients' improvement. The results of operations on the nose or throat are disappointing, and such treatment should only be recommended to relieve definite local symptoms. Cases arising in the first five years of life are less successful than those beginning later. This may depend on the unfavourable factor of a positive heredity. Asthmatic symptoms commencing after middle life are also apt to be less amenable to treatment. The duration of the disease before effective treatment is undertaken is of the greatest importance; the longer the delay the less satisfactory the result, although certain cases of long standing have benefited considerably under adequate treatment.

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## Reviews.

**THE BACTERIOPHAGE AND ITS CLINICAL APPLICATIONS.**—By F. d'Herelle. Translated by G. H. Smith. London: Baillière, Tindall and Cox. 1930. Pp. VIII plus 254, 18s. net.

THE wealth of experimental material presented in this monograph formed the basis of the Lane lectures at Stanford University in 1929. The English translation is welcome for it gives a very clear and concise introduction to the study of bacteriophage. It is written in an extremely lucid style and reads like a romance. In the preface Professor d'Herelle says, "the biologists also had erected a splendid structure into the foundation of which they had harmoniously interlocked the cellular theory of life, the theory of the fixity of bacterial species and that of 'antibodies' ornamented with 'side chains' such as would explain recovery and all immunity. Suddenly bacteriophage made its appearance. The structure could not support the added weight of the new facts, it crumbled." Professor d'Herelle was responsible for the introduction of bacteriophage and he can be accused of having shattered this time honoured biological structure. Out of the ruins he has built up a new structure by experiment and by deductions which are both fascinating and convincing and cannot be dismissed without serious consideration.

The discovery of bacteriophage was an epoch-making one, and in Chapter I the author presents an interesting history, and an account of the steps that led him to wrest from Nature its closely guarded secret of the ultra-microscopic virus. Bacteriophage, or *Protobios bacteriophage* as its discoverer has named it, is a living being, an ultra-filterable parasite, having a metabolism of its own, is composed of simple protoplasmic micella, the protules. This corpuscular being has been photographed, measured, its electrical charge investigated, its living nature established fully by overwhelming experimental data and by independent observers. The author has not allowed his enthusiasm to cloud his reasoning, and in Chapter III, step by step he breaks down all the arguments advanced against the living nature of bacteriophage. The theories of Kabeshima and Bordet are fully discussed.

Chapter II deals with bacterial mutations, and perhaps in this more than in any other subject in bacteriology the literature has assumed such enormous proportions, that it would be difficult for any one author to deal with it adequately. What were regarded as chance mutations or cycles in the life history of bacteria can now be carried out under the influence of bacteriophage. Changes in morphology, in fermentative power, motility, chromogenesis, proteolytic power, agglutinability, virulence and ultra-filterable forms of bacteria, can all be brought about by bacteriophage *in vitro*. These changes may be transitory or permanent and the author holds that they represent reactions and adaptability of bacteria to their parasite, the bacteriophage. They are changes of bacteria—bacteriophage symbiosis—the more complete the symbiosis, the more permanent the change, and if the bacterium can rid itself of its parasite it again resumes its true form. The filter-passing stage, the protobacteria, are of immense importance to epidemiology. The contention that visible bacteria have a filterable phase is supported by such a wealth of testimony from other observers that it cannot be cast aside. It is not surprising that these conceptions, upsetting to orthodox bacteriology, were received with scepticism and antagonism. Experiments are so conclusive on this point and so easy of repetition that one cannot but be convinced. The author pictures that Utopia, when man will be able to so enhance the virulence of bacteriophage that all bacterial forms will be for ever destroyed and diseases due to bacteria disappear.

Chapters IV and V are devoted to a study of infectious diseases, recovery and immunity. In any infectious disease there are three living beings, the host, the bacterium, and the bacteriophage. It is on the actions and reactions of these three that the symptom-complex of the disease depends. The condition of the patient is a function of the behaviour of bacteriophage upon the invading bacteria. The mode of action of bacteriophage may be summarised as:—

- (i) Direct parasitisation.
- (ii) Lysins—enzymes secreted by the bacteriophage in process of bacteriophage act as opsonins and lead to destruction of bacteria by phagocytosis.
- (iii) Loss of virulence of bacteria.
- (iv) The split products of bacteria in the process of bacteriophage *in vivo* are distributed throughout the body and lead to an acquired immunity.

The last chapter, headed 'the use of bacteriophage,' will appeal to clinicians. Here a mass of clinical evidence is produced to prove the value of bacteriophage as a therapeutic agent. Stress is laid on the use of virulent races of bacteriophage. In bacillary dysentery and cholera, bacteriophage is specific, and evidence of clinical trial all over the world is quoted. Bacteriophage in acute colon bacillus infections is highly effective, less so in chronic conditions. It is of some value in sprue, in infantile diarrhoeal conditions and in enterocolitis. In typhoid and paratyphoid it is of no proven value, although isolated cases of success are reported. In carbuncles combined with auto-haemotherapy, in paronychia, acne, syccosis, osteomyelitis, otitis, skin conditions, empyema, septicæmia, chronic bronchitis, angina, coryza, bubonic plague, success in

the use of bacteriophage is illustrated by clinical records.

In his researches on bacteriophage and its nature, Professor d'Herelle has shown that the cellular theory of life is untenable, and suggests that the unit of life is the ultra-microscopic protoplasmic micella—the protule: that bacteria are not cells in the histological sense but aggregates of ultra-filterable corpuscles, each endowed with elementary life and capable of multiplying in the dispersed state. The importance of the phenomena of bacteriophage in relation to general biology, pathology, immunology, epidemiology, and hygiene is immense, and as Professor d'Herelle concludes, the discovery of the bacteriophage was of such a nature as to cause within the biological sciences a revolution comparable to that which the discovery of the electron caused in the physical sciences.

All the statements by the author will not find ready acceptance, but they cannot be discarded without serious thought and will undoubtedly stimulate further work. The book is admirably written, well printed, and although small in size the subject of bacteriophage has been well expounded. It should prove of the greatest service not only to the student of this subject, but to all bacteriologists in general. It is to be hoped that this volume is the first of a series, and that others will follow.

C.L. P.

**METHODS AND PROBLEMS OF MEDICAL EDUCATION (SIXTEENTH AND SEVENTEENTH SERIES).** Published by the Rockefeller Foundation, 61, Broadway, New York, U.S.A., 1930. Pp. 251, intended for distribution to teachers and administrators in medical schools and hospitals.

THESE two volumes embody the reports of 50 departments and institutes of anatomy, histology and embryology, of universities from different parts of the world. The object of these publications is to disseminate information regarding plans of new buildings, laboratories, methods of instruction, researches and experiments in teaching. Any one interested in the fundamental problems of medical education may travel to other countries for first hand information, but the benefit he derives is limited to himself and his associates in a single institution. These publications, widely circulated as they are, place before all persons interested in medical education the methods adopted in different parts of the world. Thus these two volumes dealing with the subject of anatomy and its subdivisions place before every anatomist the methods of embalming cadavers, the materials used in the construction of floors and tables of dissecting rooms, the correlation of the different subdivisions of the subject, the methods of instruction, etc., from which any intelligent observer can choose for himself the best course to be adopted and the lines of improvement to be followed. The Professor of Anatomy, University of Melbourne Medical School, in enumerating the difficulties of medical education, teaching and research in Australia writes appropriately in page 25 of the Seventeenth series "These difficulties, great as they were, were enhanced by the geographical remoteness of Australia, which made it impossible to see other anatomy departments or to consult with their designers, and such publications as *Methods and Problems of Medical Education* were not then (1919) in existence, nor had the present 'Unit' system of construction been evolved." Thus these publications are of inestimable boon to the cause of medical education. It would have been impossible to gather this information by individual efforts. The Rockefeller Foundation deserves our grateful thanks for taking up this work among its other activities for the spread of education and encouragement of research.

N. P.

**PIONEERS OF PUBLIC HEALTH.**—By M. E. M. Walker. Edinburgh: Oliver and Boyd. 1930. Pp. XV plus 270. Price, 12s. 6d. net.

ON the façade of the new building of the London School of Hygiene and Tropical Medicine stand out in

bold relief twenty-one names. None are alive. The idea was Sir Andrew Balfour's, we believe, and the names were chosen by a small committee. They represent the pioneers who first explored the fields of public health and tropical medicine. Twelve are British, four are from the United States of America, three from Central Europe and two from France. The names are Sydenham, Pringle, Lind, Frank, Jenner, Shattuck, Chadwick, Farr, Simon, Pettenkoffer, Parkes, Pasteur, Lister, Lewis, Koch, Manson, Laveran, Reed, Gorgas, Biggs and Leishman. Big names. All are dead and in George Eliot's words are now members of—

".....that choir invisible  
Of those immortal dead who live again  
In minds made better for their presence,  
And with their mild persistence urge men's search,  
To vaster issues.....  
That watched to ease the burthen of the world,  
Laboriously tracing what must be  
And what may yet be better.....?"

Most names are familiar, but even some medical men may wonder who Lind and Pringle and Shattuck and Biggs were, and may have forgotten what Sydenham, Chadwick, Farr and Simon did for suffering humanity.

Mrs. Walter has produced a delightful book where at a sitting one can retrace the development of medicine and applied preventive medicine from its scientific beginnings up to the present time. The authoress has sketched her portraits well, has brought out the special individuality of each man, his special attributes and special contributions, either to knowledge or administration. Sydenham the acute observer and rebellious against century-old dogmas, beliefs and practices; Shattuck and Chadwick the enthusiastic laymen, the one in America, the other in England, who saw before any medical man what the "sanitary idea" could do for mankind; Farr the statistician; Pasteur the genius; Pettenkoffer the chemist and vigorous arguer; Lister the scientific benefactor; Manson the pioneer of tropical medical science; Reed the experimentalist; Gorgas and Biggs the administrators. There are excellent portraits with each short biography and two artistic sketches of the new London School of Hygiene and Tropical Medicine. We read the book with great pleasure and profit and would advise every real student of hygiene and medicine to get a copy.

A. D. S.

#### PHYSIOLOGICAL PRINCIPLES IN TREATMENT.—

By W. L. Brown, M.A., M.D. (Cantab.), F.R.C.S. With the collaboration of R. Hilton, M.A., M.B. (Cantab.), M.R.C.P. Sixth edition. London: Baillière, Tindall and Cox. 1930. Pp. X plus 464, with 8 figures in the text. Price, 10s. 6d. net.

THE publication of a sixth edition of Dr. Langdon Brown's well-known book on "Physiological Principles in Treatment" within a quinquennium of its preceding edition speaks well both for the rapid strides made in the advancement of medical science, and for the great popularity of this book as a standard work. Since its first publication in 1908, the progress in physiology in relation to medicine has been so vast and profound, that many statements then considered as startling are now looked upon as commonplace; on the other hand several pet theories then in vogue have been either discarded or superseded. To bring the present state of our knowledge on the subject into proper perspective and proportion, the book has been thoroughly revised in this edition. Recent work on ovarian hormones and the liver treatment of pernicious anaemia have been newly incorporated. The sections on diabetes, the parathyroids, vitamins, the rôle of hydrochloric acid in digestion, fractional test meals, and the treatment of Graves' disease, have all been re-written in the light of the latest work on the subjects.

The present edition is an up-to-date and lucid exposition of a subject most important to the medical profession, which has every reason to be grateful to the author and his collaborator Dr. R. Hilton for this handy and useful volume.

S. S. R.

#### THE PHYSIOLOGY OF LOVE.—By George M. Katsalnos, M.D., Ph.D. (Privately printed at Boston, Massachusetts, U.S.A.) Pp. 326.

DR. KATSALNOS is well known as a writer on sexology and "The Physiology of Love" is another production from his pen. The title of the book is attractive, no doubt, but as one goes through the subject-matter the interest lags and the scientific mind is left with the impression that it is a piece of light literature fit for easy-chair reading. Throughout the book quaint imagination has been allowed to play a greater part than solid reasoning. The woman is depicted as a parasite made for the sexual gratification of man. Again the statement made that a woman's love for man is dependent mainly on the sexual pleasure she derives from his company is a preposterous assertion which cannot be allowed to pass unchallenged. Indeed the book cannot be properly called a book on physiology, but is a strange and incongruous mixture of physiology, sex psychology, poetry and erotic imaginings.

R. N. C.

## Annual Report.

GOVERNMENT OPHTHALMIC HOSPITAL, MADRAS, ANNUAL REPORT FOR THE YEAR 1929. BY LIEUT.-COL. R. E. WRIGHT, C.I.E., M.D., D.P.H., I.M.S. MADRAS: SUPERINTENDENT, GOVERNMENT PRESS. PRICE, RE. 1-8-0.

THIS report well maintains its great value to all ophthalmological workers, who would do well to consult it in the original. As usual, it consists of two parts; a brief administration report, which is now placed at the end of the report, and a very full professional report, which is a record of the progress made during the year and contains much of great professional interest.

Taking the administration report first, the number of beds available was 170, and the daily average number of in-patients 225.3—a sufficient indication of the growing needs of the hospital. The refraction room accommodation is being increased, and this work will probably be completed in 1931. The accommodation for refraction work will be about doubled. During the year 3,911 in-patients were treated, and 27,113 out-patients; operations totalled 5,197, of which 1,613 were for senile cataract. The daily average attendance in the out-patient department was 290.6. Ninety students were trained during the year. The total income and expenditure both stood at a figure of Rs. 1,70,233; but this does not include the salaries of the Superintendent and Resident Medical Officer, both of which are debited to the Madras Medical College; the figure however shows how economically the hospital is run. The expenditure from the Poor Fund during the year was Rs. 331.

It is the professional side of the report, however, which will interest our readers most, and we take the following abstracts from it:—

#### Cataract work.

There is very little new work to record under this head for 1929. We continued to employ a bridge flap with satisfactory results. Compared with last year, the iris prolapse rate was somewhat reduced being 1.07 per cent. for all operators. It is probable that this is due to the continued employment of bridge flap. The vitreous escape rate for all operators was 1.97 per cent. a slight increase. The Barraquer procedure was adopted in 119 cases as compared with 243. This is not because we had any reason to find fault with the immediate post-operative results in those cases in which we elect to employ it, but probably because last year we were searching for cases and anxious to try as many as possible. In 1929, we practically confined its use to immature cataracts which otherwise appeared to be straightforward.



It is perhaps worth recording that we have seen a larger number of persistent shallow chambers due to adhesions of capsular tags to the corneal endothelium since the adoption of the bridge flap (approximately 3 per cent.). This is not a very serious complication although undesirable. In many cases the chamber re-forms rapidly and the adhesion breaks down with the use of dionine or subconjunctival cyanide injections. In some cases the adhesion was broken down by means of a fine spatula or iris repositor inserted through a small keratome incision during the second week after operation. This is the only complication which appears to have increased in frequency since the introduction of the bridge flap, and as the iris prolapses and vitreous escapes have been considerably reduced, it need hardly be considered a deterrent. A change in the routine blocking of the seventh nerve was adopted, O'Brien's method of akinesis being introduced. It is easier and quicker than the method described here some years ago and which we have been using until recently with excellent results. It apparently did not come into general use because of the supposed difficulty of technique.

Further observations were made on the factors which influence the intra-ocular pressure during cataract operations after the section has been made. It appeared to us that in the average Indian patient coming on the table for cataract operation, the connective tissue of the orbit is less in volume than one might expect in normal persons. Consequently we made observations during the course of the year in which we differentiated between patients with what appeared to be normally prominent eyes and eyes more or less prominent than normal. The figures are as follows:—In 887 consecutive operation cases, 499 appeared to be normal, 293 less prominent than normal, and 95 more prominent. We found that when muscular influences were eliminated as far as possible, nearly 80 per cent. of less prominent eyes showed the posterior segment pressure negative (judged by the behaviour of the vitreous body after the lens is removed, so that the iris and capsule sag are concave to the horizontal plane described in last year's report). Of sixty more prominent eyes examined, 70 per cent. showed the posterior segment pressure positive and the vitreous inclined to push the capsule forward, causing the iris to become convex to the horizontal plane and occupy not only the space vacated by the lens but part of the anterior chamber. The other 35 were not noted on. In 4 per cent. of cases with retracted eyes, the posterior segment bulged forwards. In 382 of the patients noted on, with normally prominent eyes, the posterior segment pressure was positive, negative or zero in an approximately equal percentage of cases. There appeared to be a definite relation between the liability to a low intra-ocular pressure and a sunken orbit and between an increased intra-ocular pressure and a bulging orbit under the conditions of the experiment. When the orbital contents had decreased in volume, on making the section and removing the lens, the posterior segment was not inclined to bulge forward into the space previously occupied except in a small percentage of cases. Further observations confirmed our opinion stated last year that when the cataract has been extracted and the lips of the section are lying in apposition, actual movements of the recti muscles do not appear to have as much influence as one might suppose in causing the section to gape under the thrust of the contents of the posterior segment. It is the sudden initiation of such movement that appears to cause the section to gape.

#### Glaucoma.

With regard to the clinical investigation of glaucoma cases commenced in 1928 and continued into 1929, referred to in last year's report, the following points may be given in continuation.

On charting out the results of the bio-chemical blood examinations made for us by Dr. A. S. Mannady Nayar, Professor of Bio-chemistry, Medical College, Madras, it was apparent that there was no obvious information to be derived from the figures. Dr. Mannady Nayar

is not yet in a position to state that the information to be derived from the investigation is completely negative until he has considered the various clinical factors, age, etc., in each case in conjunction with the figures. So far then, the bio-chemical examination of the blood in our glaucoma patients has not been of any practical value to us.

*The use of adrenalin.*—Last year we drew attention to the use of adrenalin packs. This method of treatment has been of such value that it has found a definite place in our routine. It may be of interest to show in tabular form the effect of adrenalin packs in an average series of ten cases of very high tension. It will be observed that there is an initial rise of tension for some hours followed by a slow fall which continues and reaches its lowest point on the third day. This fall is maintained for a variable interval, generally not more than a week and then a rise sets in. It was found that frequent instillations of eserine before and after the pack tended to diminish the initial rise. It was always more effective to combine eserine drops with adrenalin than to use adrenalin alone, even though eserine in the first instance failed to bring down the tension. One of the most practical points in connection with adrenalin pack is that it may be used in bad cases to bring them to a suitable state for trephining. A short article, illustrated by interesting tension charts showing some of the effects of adrenalin packs, was published in *British Medical Journal* for September 1929.

The injection of adrenalin hypodermically produces a similar fall on the third day, but of very slight extent and without any remarkable variation in the blood pressure. The adrenalin pack produces a definite dilatation of the pupil and this appears to last through the period of rising tension, but subsequently the pupil becomes smaller again.

*Ephedrine.*—In four cases, this drug was administered by the mouth in conjunction with eserine drops. It was ineffectual except in one instance, and even in this case when eserine was stopped, the tension rose again. Ephedrine was used in doses of gr. 2 daily.

*Glaucozan.*—Neither levo-glaucozan nor amine-glaucozan were as satisfactory as adrenalin packs in these primary glaucoma cases. The amine was, however, more satisfactory than the levo-glaucozan.

*Operative treatment.*—A useful piece of technique which we have had in use for a long time, but which does not appear to be generally known, is the control of persistent bleeding points during the formation of the conjunctival flap by a very light touch with an electro cautery.

#### Refraction Room.

Three thousand and thirty-one cases were seen and treated for refractive errors. Amongst the numerous other cases examined two hundred and sixty-eight were examples of more interesting fundus diseases. These represent but a small proportion of the fundus cases examined and may be tabulated as follows:—

	No.	Syphilis.	
		Plus.	Minus.
Diseases of choroid ..	45	8	37
Diseases of retina including—			
Retinitis pigmentosa .. 16	42	5	37
Albuminuric retinitis .. 3			
Retinal hæmorrhage .. 4			
Other diseases of retina .. 19			
Diseases of the optic nerve including—			
Optic neuritis .. 36	173	45	128
Thrombosis of central vein .. 3			
Papilloedema .. 9			
Optic atrophy, primary .. 20			
Do. partial .. 17			
Do. secondary .. 88			
Other conditions ..	8	7	1
TOTAL ..	268	65	203



A number of interesting cases were recorded in connection with this department during the course of the year.

These included a case of sub-hyaloid hæmorrhage during vomiting, the hæmorrhage appearing to come from the superior temporal vein; three cases of tobacco amblyopia; a case of eclampsia, where conditions indistinguishable from those in albuminuric retinitis were present an unusual finding in eclampsia; a very severe case of benign tertian malaria showing quinine amblyopia, in which the malaria was finally controlled by intravenous quinine, and the patient left hospital with good central vision, but with a marked contraction of fields; cases of familial macular degeneration, of familial nodular dystrophy of the cornea, and of two brothers suffering from optic atrophy. A family of five children all presented melanosis of the sclera, the father and the paternal grandmother being also affected.

One of the special features of the report is Col. Wright's account of an epidemic of superficial punctate keratitis. This is so important that we may abstract from it in his own words:—

*Superficial punctate keratitis.*

"By far the most remarkable feature in connection with the out-patient's department work of the year under review was the enormous epidemic of superficial punctate keratitis which was referred to in last year's report. A paper based on this epidemic was presented at the International Congress of Ophthalmology held at Amsterdam in September 1929 and appeared in full

The affection starts with a mild conjunctivitis, confined to one eye in the vast majority of cases; the eyes are affected with approximately equal frequency. Only about one per cent. of the cases are bilateral. There is no premonitory febrile disturbance. There is variable redness, no discharge, moderate irritation, very little lachrymation or photophobia. Sometimes the patient notices the redness, at other times slight dimness of vision is complained of. It is difficult to see the lesions on the conjunctiva, but they are sometimes visible as tiny elevations. The conjunctival smear is negative for ordinary pathogenic organisms. After a few days minute grey spots appear on the cornea in about two-thirds of the cases. Some of these may stain while others do not. They vary from a fine diffuse curdy deposit only visible with the corneal microscope, apparently confined to the epithelium, to large grey spots easily visible to the naked eye which extend into the substantia propria. Certain cases after a time become indistinguishable from the macular keratitis described by Kirkpatrick, others come to resemble the keratitis disciformis of Fuchs, and numerous transitional forms may be noted. There is always evidence of anterior uveitis of greater or lesser extent in the various fine deposits which one can see on the endothelium with the corneal microscope. There is no obvious iritis. The corneal spots are sometimes elevated, but often the epithelium is perfectly smooth. For the most part the course of the disease is short and the cornea clears within a month. In some cases, however, the spots enlarge, becoming like those described by Kirkpatrick, and may persist for over a year. It is rare for the

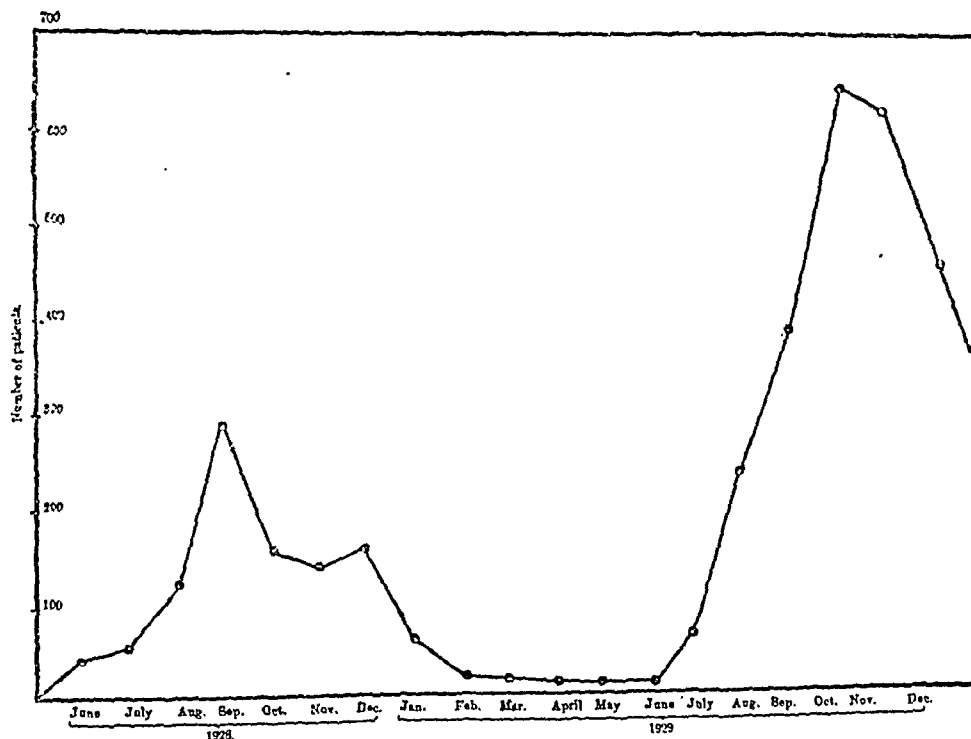


Chart showing monthly incidence of superficial punctate keratitis.

in the *British Journal of Ophthalmology* for June 1930. The materials for the paper presented to the International Congress were collected before August 1929. The chart appended shows the frequency with which cases reported at the out-patient's department including the months subsequent to those dealt with in the above report. It will be seen that there was a much heavier attack rate in the latter part of year. This epidemic augmented our average figure for the out-patient's department attendances very considerably. Including some cases seen outside, over 3,500 attacks were recorded up to the end of 1929. For the information of those who read this report to whom the *British Journal of Ophthalmology* is inaccessible, the following details of the condition may be given.

vision to be permanently interfered with in spite of a protracted convalescence. Professor Fuchs, when he described this affection in 1889, considered that it was similar to herpes febrilis, and probably of the same nature as keratitis disciformis. Verhoeff in 1901 regarded it as a neurotropic affection identical with keratitis disciformis. He demonstrated that the lesions lay on either side of Bowman's membrane and were presumably related to the corneal nerve terminals where they pierced Bowman's membrane. Gruter, and other workers, established the fact that herpes febrilis was due to a filter-passing virus, transmissible and capable of producing encephalitis. Paton (1926) states that the commonest ocular manifestation of herpes febrilis is the dendritic ulcer, and regards herpes febrilis

and herpes zoster as not etiologically identical although certain workers have put forward the view that these two affections are merely clinical variations of the action of the same virus. Levaditi in 1927 in classifying the virus diseases, includes both herpes febrilis and herpes zoster ophthalmicus in his group of neurotropic ectodermoses. There is no suggestion in the literature that superficial punctate keratitis might be similar etiologically to herpes febrilis or herpes zoster. There was formerly considerable confusion in the literature with regard to this affection. The standard description did not cover the wide variations of this disease. It evidently appeared in different forms under sporadic, endemic and epidemic conditions. The Madras epidemic has been so extensive and protracted that we have had the opportunity to see the enormous variations in the clinical features which this disease may present. Under such conditions where the same etiological factor was practically certain we observed clinical types similar to well-known forms of keratitis such as the keratitis disciformis of Fuchs, the epidemic punctate keratitis of Herbert, the macular keratitis of Kirkpatrick, the keratitis epithelialis punctata of Koeppe, and intermediate transitional forms between them. The macular keratitis of Kirkpatrick described in 1920 is probably familiar to most doctors in Madras. We now realize that such pictures as he described may be seen on following up some of the cases which start with the typical clinical picture of superficial punctate keratitis.

It would take too long to deal with the extraordinary variations in the disease which we have met with. Patients have been referred to us with such marked conjunctival disturbance that this condition has been mistaken by medical practitioners for gonorrhoeal conjunctivitis. On the other hand, certain cases have presented such mild conjunctival features that they would have been overlooked except that a trivial disturbance of visual acuity brought them to the eye hospital. In these the corneal microscope revealed the true nature of the disease.

With the corneal microscope there is just as great a variation in the degree of anterior uveitis as there is in the conjunctival symptoms which are more obvious to the ordinary observer. Up to the present we have not observed any serious iritic phenomena or late sequelæ such as glaucoma. There has not been any case so far in which synechia developed. It may be seen from the above that this disease, which is closely related to the well-known clinical affections known as herpes zoster ophthalmicus and herpes simplex or febrilis, embraces a variety of affections of the cornea which have hitherto been regarded as independent affections, or not understood at all. Hardly a week passed in which we did not see some new clinical feature. It may be readily understood therefore how easy it was for ophthalmologists in the past to miss the true nature of cases occurring sporadically and place examples of this affection amongst the hundred and odd varieties of keratitis which have been described as separate entities.

We tried to confirm Herbert's findings, but were unable to isolate any constant bacterial agent either by culture or with the microscope in stained or dark ground preparations. With the aid of our colleagues at the King Institute of Preventive Medicine, Guindy, we were enabled to undertake animal transmission experiments. Direct transmission to the cornea of monkeys was negative both with filtered and unfiltered material. Without going into tedious detail it may be stated that we eventually showed that the disease was transmissible to rabbits and man both with filtered and unfiltered material; we were not surprised that this was so as it was fairly obvious that the clinical condition closely resembled herpes febrilis in many respects, one of the great differences being that there is, as a rule, no fever or antecedent febrile condition associated with superficial punctate keratitis. In order to confirm our transmission experiments we undertook a histopathological investigation of epithelial layers removed from

the affected eyes, and finally were able to demonstrate inclusion bodies in the epithelial cells. They were rounded, sharply defined, intranuclear and cystoplasmic, more suggestive of Negri bodies or the inclusions of variola than of other varieties of cell inclusions. This finding confirmed our view that we were dealing with a condition which might be regarded as a disease of the herpetic group due to a filter-passing virus, that it was probably closely related to herpes zoster ophthalmicus and herpes febrilis but not identical with them. Of the nature of the virus we know nothing. Like that of herpes febrilis, it appears to have a predilection for manifesting itself in regions supplied by the fifth nerve. It is presumably air borne, and enters by the conjunctival corneal route following the arborisations of the corneal nerve from the epithelium through the apertures where these pierce Bowman's membrane, and thence into the substantia propria. It is doubtful if any damage is done to the nerves as far back as the ciliary ganglion, but none of our experimental animals developed encephalitis. Unlike herpes zoster and herpes febrilis, skin lesions are not present.

At first we supposed that there might be an acquired immunity. It soon became apparent that this was not so, and especially during the latter part of the epidemic we frequently observed an attack occurring in the second eye at a comparatively short interval after the attack in the first eye. In several cases there was an interval of a month or so; in others the interval was longer. In two cases the second attack was in the same eye, but this was after an interval of a year.

Recurrences in the true sense of the word were not observed although exacerbations were noted, e.g., crops of minute elevations might appear at the beginning of the disease on the conjunctiva and give rise to relatively mild conjunctivitis, subsequent to the subsidence of which the periphery of the cornea would become attacked, and still later, when all appeared quiet, fresh spots would appear at other parts of the cornea. The later spots might give rise to more severe symptoms than the earlier ones so that the patient would apparently get worse some time after the disease had become well established. It was not always possible to diagnose the disease when patients came with a very red eye, but in many cases when such a red eye was followed up, the corneal spots appeared in due course, and left one in no doubt as to the diagnosis. A negative conjunctival smear or a conjunctival smear within average limits helped one in prognosticating the development of corneal lesions at a later date.

The period of incubation under natural conditions appeared to vary from a week to a month, under experimental conditions it was somewhere about three to nine days.

In unilateral cases, the right eye was attacked with approximately the same frequency as the left. Bilateral attacks occurred more often as the epidemic became more protracted. In the last 1,000 cases of 1929, there were sixteen as compared with six bilateral cases in our first 923.

In January 1930, we first noticed patients with a definite tenderness and enlargement of the preauricular gland. Two cases were otherwise uncommon in that there was considerable swelling of the lids and chemosis. They were, however, undoubted cases of superficial punctate keratitis. Six cases were noted in two months during which period the epidemic was rapidly fading. This feature may have been missed earlier in the epidemic, but was undoubtedly absent in large numbers of cases of average intensity. It may be due to the same agent which produced the corneal lesions or to a secondary infection. Against the latter it may be noted that in these cases although they showed marked hyperæmia or œdema, the bacteriological examination of the conjunctival sac was within average limits, i.e., no characteristic organism was present. This, no doubt, might also be true in such an affection as a leptothrix infection of the conjunctiva. The enlargement of the preauricular gland, however, does not invalidate the idea that the condition should be included with the neurotropic virus group.

We had to bear in mind continuously that a red eye on one side was not necessarily superficial punctate keratitis. It was very easy to mistake superficial punctate keratitis for other affections and vice versa. Unless the corneal microscope showed characteristic lesions and the conjunctival smear was negative the diagnosis could not be made with certainty in mild cases.

All cases show a marked tendency to get well; mild cases seemed to make a perfect recovery without treatment, but our experience shows that even in mild cases it is better to keep the eye covered, as the corneal lesions seem to be more persistent and more dense in uncovered eyes. It is also well to keep the eye at rest as there is always an anterior uveitis even if only seen with the corneal microscope. One may have a quiet looking eye with well marked anterior uveitis. Cycloplegia is therefore indicated in almost all young people and in many older people who do not show a predisposition to glaucoma. A cold wet pad under the spectacles or an eye patch gives comfort and rest and an antiseptic sedative ointment such as chloretone ointment is indicated at bed time. In the later stages, when the conjunctival affection has subsided and the eye is white, but the corneal spots remain, dionine is useful. The more complicated cases require special care, and we consider that severe forms are more liable to have a subsequent interference with visual acuity if the eye is not carefully occluded and cared for from the start.

#### *Prevention of blindness.*

In connection with our prevention of blindness propaganda we aim at fitting up the out-patient's department with pictures, posters, pamphlets, etc., forming a sort of standing propaganda centre. We hope that eventually all our ophthalmic hospitals and ophthalmic departments of headquarter hospitals will function similarly.

Efforts of this type are being directed along the following lines:—

(1) Distribution of pamphlets denouncing couching for cataract, drawing attention to the importance of keratomalacia, ophthalmia neonatorum, small-pox, irritant remedies, trachoma, and congenital syphilis.

(2) Lectures on prevention of blindness to senior students of colleges and schools, and to teachers under training in training schools and colleges.

(3) Distribution of posters on the above subjects to health week centres, schools, etc.

(4) Movement to establish standard lectures on prevention of blindness in all schools.

#### *Keratomalacia and ophthalmia neonatorum.*

As mentioned in last year's report, we consider that keratomalacia in children is possibly the most serious cause of preventable blindness in Madras and in any case more serious than ophthalmia neonatorum. Lieut.-Cols. Duggan and Kirvan take a similar view as to the position which keratomalacia holds as a blinding disease in Bombay and Bengal respectively. Col. Dick, on the other hand, informs me that keratomalacia is negligible in the Punjab where deficiency disease is at a minimum. Dr. Acharya of Lucknow considers the position in the United Provinces similar to that in Bengal, Bombay and Madras.

During the year the following figures were collected in the out-patient's department showing the frequency with which keratomalacia and ophthalmia neonatorum were met with.

Age.	Keratomalacia cases.	Ophthalmia neonatorum cases.
5 years and under ..	67	59
5 to 6 years ..	5	..
6 to 7 years ..	1	..
7 to 8 years ..	2	..
8 to 9 years ..	2	..
9 to 10 years ..	3	..
Between 10 and 20 ..	11	..
Over 20 ..	4	..
TOTAL ..	95	59

Blindness is a very much more common sequel in keratomalacia cases than in ophthalmia neonatorum. In fact it is rare to lose an eye from the latter unless the cornea is already badly damaged before the case reports to hospital. It is a regrettable fact that practically all the ophthalmia neonatorum cases were in children at whose birth a fully qualified doctor or fully qualified midwife was in attendance. This points to the great importance of better and more insistent teaching in connection with the prophylaxis of ophthalmia neonatorum. Measures ought to be adopted in this country similar to those which are now adopted in Europe in this connection. Many of these children were born in institutions which cater for the diseases of women and children. As the facts stated above appertain in the city of Madras it is probable that the situation is still worse in the outlying districts. The methods of prevention usually recommended in Europe are taught to all students and post-graduates who undergo training in this hospital, but as far as I can gather the practice amongst accoucheurs in the city is not along these lines. Fortunately for the general public gonorrhoeal conjunctivitis, whether in the new born or the adult, does not seem to be as destructive a disease in Madras as it is in Europe. Whether we are dealing with a more resistant soil, or an organism of diminished virulence it is impossible at the moment to say. Dr. Happer, Specialist in Venereal Diseases to the Madras Government, informs me that gonorrhoeal urethritis does not appear to be such a severe affection or as difficult of treatment here as it is in England. His experience is therefore in line with ours.

#### *Lymphoblastomatous conditions of the orbit, tumours of lacrymal gland and allied conditions.*

Last year we brought our experiences of such conditions up to date. During the year 1929, the following were recorded.

*Mikulicz's disease.*—R., Hindu male, aged 12, admitted for proptosis both eyes on 11th October, 1926. Bilateral enlargement of lacrymal glands, both eyes proptosed, exposure keratitis in the right eye. Right preauricular gland involved. R.E.V. = P.L., L.E.V. = 6/36.

15th October, 1926. Tarsorrhaphy was done on both sides. He took his discharge and returned on 25th February, 1927. It was considered that the condition permitted of the lids being slit open a little on either side. Again returned on 29th September, 1929. The right preauricular and submaxillary glands were enlarged, also the left posterior auricular gland. The orbital masses had increased in size and the skin over them was tense and shining. It was desired to treat the patient with radium but he was admitted to another hospital and the parents did not respond to our request to send him back here.

*Bilateral lymphoblastoma without myelogenic changes in the blood, improved by radium.*—C., male, aged 4 years, was admitted on 18th March, 1929, for proptosis left eye and exposure keratitis below. The right eye had been removed elsewhere five months ago. There was no lymphadenitis, the liver and spleen were normal. The left fundus was normal. The blood count showed a slight increase of lymphocytes. Pieces of tissue removed from right socket for histopathological examination showed lymphoblastoma. The left orbit was treated with buried radium which reduced the proptosis. Patient was discharged on 15th May, 1929.

*Chloroma.*—A Hindu female, aged 7 years, was admitted on 20th September, 1929, for proptosis, right eye. A firm swelling was felt below the superior temporal orbital margin. The eyeball was pushed downwards and forwards and movement restricted on the temporal side. There were no metastases, the blood showed a lymphocytic increase, but no myelocytosis.

Exploration. A mass, greenish in colour, uniformly granular on section and of a consistence slightly firmer than lymph gland was exposed. It gave every appearance of chloroma and histopathologically was composed of a uniform round-celled tissue of a lymphoblastomatous type. The case was treated with radium and

to our surprise got quite well. We hesitated to consider this a true case of chloroma in view of the blood examination and the lack of metastases, but there can be no doubt that the mass was chloromatous tissue.

The chloroma syndrome perhaps may not necessarily embrace extensive blood change, metastases and death.

**Multiple angio-sarcoma.**—An infant, about two months old, was admitted for keratomalacia, both eyes. The child was ill-nourished, there was no diarrhoea, the liver and spleen were not enlarged. The cornea were completely opaque and dry. Since birth the child has had small superficial plum-coloured nodules over the trunk and extremities. They were said to have increased in number at the time of examination. They were about 25 in number and were freely movable, the skin immediately over them appeared to be adherent. One of these nodules was excised for pathological examination and found to be angio-sarcoma. The child died the same evening.

#### Uncommon clinical cases.

**Myiasis.**—A Hindu female, aged 4 years, was admitted for sloughing phagadenic ulcer below left lower lid, with a history of having applied irritant remedies for a small swelling noticed 14 days before admission. There were numbers of maggots in the granulation tissue. Some were removed and bred in meat and earth. On the 15th day a small fly hatched out, on the 21st day two larger flies hatched. They were sent with larvæ and pupæ to Col. Patton, Tropical School of Medicine, Liverpool, who identified them as two second stage larvæ of *Chrysomya bezziana* and adults of *Sarcophaga fuscicauda*.

**Intermittent exophthalmos.**—P., Hindu female, aged 45 years, admitted for cataract both eyes, presented an interesting picture of intermittent protrusion and recession of the right eyeball. When she lay on the right side, the eyeball protruded more than when she lay on the left. When she stooped forward, the globe almost escaped from the socket. When she lay on her back the globe receded leaving a deeply sunken orbit. Pressure on right jugular vein brought about proptosis. No pulsation was felt in the proptosed condition. The movements of eyeball were normal. Strain or coughing did not cause proptosis. No engorgement of episcleral veins.

The condition was said to be present since birth.

R.E.V. = P.L., no projection. L.E.V. = P.L., projection in all directions.

Pupils round, active and symmetrical. Tension normal, globe symmetrical.

Lens, cataractous, both eyes. Cataract extraction was done on the left side with good result, 6/24 with a + 10 D.

**Hard sore of lid.**—A Hindu male, aged 8, was seen at the out-patient's department with a hard sore on his lid. He was covered with a secondary rash. His two younger brothers were found to have secondary manifestations. The father showed mucous patches.

#### Radium treatment of eye conditions.

We were enabled to continue our observations on radium treatment. Our technique was as follows:—

For applications to the limbal or bulbar region the radium needle was embedded in a paraffin shell moulded to fit comfortably over the globe with the lids closed. A paraffin of suitable melting point was chosen, not too brittle, and after necessary cocainisation a disc about the thickness of an ordinary double shell glass eye was moulded over the globe under the lids to form a comfortable meniscus. This was carefully removed so as not to distort it, and hardened a little. A hole was then made in a suitable position for the reception of the needle. If the growth or portion to be treated was at the limbus or on the globe, the needle was made to project slightly on the concave aspect of the paraffin shell. When it was desired to treat the lid, the needle was fully embedded in the shell and subsequently the overlying paraffin on the convex surface of the shell was cut away so as to expose the needle at the bottom

of a gutter. In such cases a thin metal filter 1 mm. thick brass, gold plated was placed on the concave side of the shell over the cornea.

The following details regarding the needles were supplied to us by Capt. T. W. Barnard, Radiologist, Government X-ray Institute, who gave us every help in this connection and to whom our thanks are due.

One milligramme needle ..	Contains one milligramme of radium sulphate (RaSO <sub>4</sub> ) in a platinum needle the walls of which are 0.5 mm. thick.
Five milligramme needle ..	Contains five milligrammes of radium sulphate in a platinum needle, the walls of which are 0.5 mm. thick.
12.5 milligramme needle ..	Contains 12.5 milligrammes of radium in a platinum needle, the walls of which are 0.5 mm. thick.

Dosage in the case of small growths or chronic diseases of the globe or lids was of an experimental nature.

The first opportunity of treating an epithelioma of the limbus presented itself in May. This case gave us an excellent opportunity of observing the effect of the radium exposures on the globe and gave us a guide in connection with dosage in other cases. For this reason it may be reported in detail.

**A case of epithelioma limbus treated by radium.**—V. R., Hindu, male, aged about 60, was first seen on 27th May, 1929. There was a small epitheliomatous mass at the limbus on the nasal side of the cornea in the right eye. It was 8 mm. long and 2.4 mm. wide. The vision was 6/9 on either side, improved with glasses to 6/6. There was asteroid hyalitis, right eye. The following radium applications were employed using a radium needle embedded in a paraffin shell as described above. The radium needle impinged on the growth where it projected on the concavity of the paraffin.

1st June, 1929 ..	1 mg. radium needle for 3 hours.	3 mg. hrs.
5th ..	1 mg. radium needle for 2½ hours.	2½ mg. hrs.
10th ..	4 mg. radium needle for 2 hours.	8 mg. hrs.
14th ..	2 mg. radium needle for 2½ hours.	5 mg. hrs.
16th ..	Growth definitely smaller	
19th ..	4 mg. radium needle for 3 hours.	12 mg. hrs.
21st ..	Growth disappearing.	
24th ..	Two 2 mg. radium needles for 2 hours.	8 mg. hrs.
28th ..	Two 2 mg. radium needles for 2½ hours.	10 mg. hrs.
Total radium applied 48½ mg. hrs.		

27th November, 1929. "The distant vision remains the same as when first seen. There is no evidence of the growth. There are lenticular opacities in the inferior nasal quadrant. The eye was not examined under a mydriatic prior to radium treatment, so cannot say whether these opacities have any connection with the treatment. However, it seems unlikely as there has been no change in the vision." The asteroid hyalitis definitely pre-dated the treatment. Evidently the dosage employed was quite sufficient to destroy a growth of this size and we used similar doses in subsequent cases when trying the effects of radium on spring catarrh, trachoma, ulcers of the cornea, etc., as shown below.

The following conditions were dealt with on similar lines and with the technique employed in the above case.

**Spring catarrh.**—The first case was one of limbal spring catarrh of both eyes chiefly disposed in masses at the superior segment of the limbus slightly wider and higher than the epithelioma above referred to, together with slight elevation all round the cornea. The right eye only

was treated, the left eye being used as a control. No improvement whatever was effected. In fact the eye became decidedly more irritable and the palpebral conjunctiva became swollen and inflamed. The total dosage 32 milligramme hours was completed on 30th January, 1930. In the case of spring catarrh where the disease was confined to the upper lid and represented by flattened papillary elevations of the mucous membrane similar dosage produced no effect whatever nor was there any amelioration of symptoms. The total dosage was 36 milligramme hours.

These results are interesting in view of the conflicting reports which one reads of in the literature.

*Trachoma.*—In trachoma, measured dosage on similar lines, about 50 milligramme hours in all, did not produce any amelioration of the condition in one eye as compared with the other. In fact here again the treated eye became more irritable.

*Rhinosporidium.*—In the case of a small pear-shaped rhinosporidial polyp of the lower lid about 5 mm. by 3 mm., the polyp necrosed and disappeared with a total application of 40 milligramme hours, but before this final dosage was reached the polyp was decreasing in size. This is probably the first record of the treatment of a rhinosporidial polyp by radium.

*Aspergillus tumour.*—A recurrent aspergillus tumour of the orbit previously recorded in the 1925 Report as having been beneficially influenced by X-rays was uninfluenced by 2,675½ milligramme hours of radium.

*Marginal ulcers of cornea.*—Deep undermined marginal ulcers of the cornea of an indolent type, rodent ulcer like, but not true rodent ulcers of the cornea, responded rapidly and well to small doses of radium.

*Sarcoma, chloroma and lymphoblastoma.*—Round celled sarcoma of the orbit, chloroma of the orbit and lymphoblastoma of the orbit appeared to be markedly radio-sensitive and cleared up rapidly with comparatively small doses.

We are unfortunately not able to record the result of radium on gliomata. We placed needles in the stump of the nerve as it lay in the optic foramen in those cases where we had reason to think the growth had extended back along the nerve. The patients so treated could not be followed up. We have no clinical details to show whether small epithelioblastomata of the retina are sufficiently radio-sensitive to be readily destructible, but inoperable tumours of this nature in our experience are impracticable to deal with.

## Correspondence.

### INTRAVENOUS QUININE.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I quite agree with Dr. Nambier (*Indian Med. Gaz.*, July 1930, p. 417) as to the necessity for the more frequent use of quinine by the intravenous route. I have been using it since 1919. Towards the end of 1918 I gave four intramuscular injections of quinine, but in one patient a sterile abscess resulted about a month after the injection, and since then I have abandoned the intramuscular method altogether. During the last 12 years I have given hundreds of quinine injections intravenously without a single mishap. My usual treatment for chronic malaria is quinine intravenously on alternate days for 3 injections, followed by one of neosalvarsan in moderate dose. This course is repeated a fortnight later. No quinine was given by the mouth, though lately I have been giving tablets of Plasmochin Co. during the fortnight's interval. This district is not very malarious, but the cases that I get respond very favourably to this line of treatment. In ordinary cases of fresh infection with malaria, I give only 2 injections with one day in between, and no quinine by the mouth. I used to give the injections with the patients seated, but since the bugbear of sudden lowering of blood pressure has been raised a few years ago, I now give the

injection with the patient lying down, especially if he appears to be weak.

If the profession takes more kindly to the use of quinine by the intravenous route, very large amounts of quinine could be saved. A doctor sent out on malaria duty should be skilled in intravenous injection, and be supplied with the necessary facilities for such.

I use quinine bihydrobromide in the strength of gr. i to 1 c.c., and keep 5 c.c. and 10 c.c. ampoules ready for use. This is a convenient strength for calculation of dosage. The scarecrow raised that quinine should only be given intravenously in extreme dilutions is a myth. Even a solution of strength gr. v to 1 c.c. can be used, provided the injection is given very slowly. When I have occasion to use a solution of this strength, I inject 2 or 3 drops, wait for a few seconds, then repeat, until the dose of 1 or 2 c.c. is finished after four or five pauses. No discomfort or ill effect follows this procedure.

I believe that it is time for the medical profession to give up the idea that nothing short of saturation of the system by large doses of quinine for weeks on end is necessary to rid one of malaria. Devastate the crop of plasmodia in the blood by a few floods of quinine, and strengthen the system by an arsenical preparation, and the patient's improved power of resistance will do the rest. Of course it will be necessary to educate the public to take such injections, just as it has been in the case of anti-plague inoculation. I may be considered too optimistic, but I trust that your readers will try intravenous quinine for themselves and report the results.—Yours, etc.,

D. M. VASAVADA, L.M. & S.

BAZARFALIA, JUNAGAD,

KATHIAWAR.

2nd August, 1930.

[*Note.*—At the moment of going to press, we have just received, and hope to publish in our issue for November 1930, an exceedingly important paper by Major J. A. Sinton, V.C., I.M.S., Director of the Malaria Survey of India, on a standard treatment for malaria. Major Sinton's paper summarises the well known research work which he has been carrying out during the last nine years; it gives an analysis of the results of different lines of treatment in 37,000 cases very carefully controlled, observed, and followed up.—EDITOR, I. M. G.]

### ULCUS TROPICUM.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—Having read the correspondence in your columns with regard to ulcer tropicum and Naga sore, I am induced to send you my notes on the disease as seen in Gujarat. The disease is fairly common in this side of the country, though previously it had not been regarded as a separate clinical entity. During the last two years I have seen some 150 cases. The patients come from both the town and the mofussil, those from the town coming chiefly from its environs. The disease occurs almost exclusively among labourers who work on the railway line or in the fields, and the site of the ulcer is usually below the knee. There is always an inflammatory zone around a fresh and progressive ulcer. The discharge is thick and foul.

I have tried various remedies, both local and constitutional, for this complaint, but the best results are obtained by local carbolic acid application followed by dressings with boric ointment. After one application the pain usually disappears, the discharge becomes markedly less, and healing commences. A second application is necessary if unhealthy spots persist in the ulcer. Treatment by this method is short and painless. I have never seen any symptom of carbolic acid poisoning in any of my cases.—Yours, etc.,

VENILAL N. MODI, M.B., B.S.

RAOPURA, LIMDAPOLE.

BARODA,

30th June, 1930.

## ANTITYPHOID INOCULATION.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I shall be grateful for an expression of opinion on the necessity for the use of two injections of T. A. B. vaccine in a person already protected.

It is customary when using T. A. B. vaccine prophylactically on a person for the first time, to administer a comparatively small dose subcutaneously, and ten days later another dose of double the amount. Attention has hitherto been fixed on this "primary" inoculation series, but in the case of a person who has to be inoculated every 18 months, I should like to know whether it is necessary to again give a preliminary first small dose and then 10 days later the usual full dose, or just one small dose?

To my mind, a person who has already been protected, either by having had the disease or having been injected with an antigen, will have his immunity raised to the maximum level by the administration of the smallest quantity of antigen. That is to say, if vaccines act by the production of antibodies.

What is the usual procedure in the British Army with regard to protective inoculation against the enteric group of fevers? Is inoculation repeated at fixed intervals? If so, what is the interval? Another point, Cluwer (*Lancet*, 22nd June, 1929) thinks that the degree of immunity established by the oral administration of T. A. B. vaccine is at least equal to that obtained by subcutaneous inoculations; the immunity appears to be established more quickly, and no unpleasant sequelae follow. Is there any experience of this in India to back this opinion?—Yours, etc.,

J. E. L. CHINAL, M.D., D.T.M. (Bengal).

MONGHYR,  
5th June, 1930.

## MYIASIS OF CARIOUS TEETH.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—The case reported by Dr. Strickland in your issue of July 1929, Vol. LXIV, p. 386, of myiasis of a carious tooth, is by no means uncommon in the villages of Bengal. Who does not know women raids shouting "Bāt bhālo kari; dānter poka bār kari" (I cure rheumatism; I extract disease germs from decayed teeth)? One has seen such an operator put a pledget of cotton-wool soaked in mustard oil into the sockets or holes in carious teeth, and maggots subsequently crawling on the cotton-wool.—Yours, etc.,

K. C. GHOSE,

Retired Assistant Surgeon.

MONGHYR,  
5th August, 1930.

## "HONEYCOMB" INFECTION OF THE HANDS AND FEET.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I have recently had two skin cases, where the lesions present almost resembled those produced by the jigger flea, though, so far as one knows, this insect is absent from India. They were as follows:—

Case 1.—A Mahomedan, 26 years of age, came to this dispensary suffering from fever and diarrhoea, of some six months' duration. During my examination of him, I noticed in the palms of both hands, in the spaces between the fingers and toes, and on the soles of the feet, very numerous minute holes, the skin presenting a sort of honeycomb-like appearance. The patient stated that the duration of this condition had been twelve years. The fever and diarrhoea were due to kala-azar.

Case 2.—A Mahomedan, aged 20 years, came to the dispensary for the treatment of an ulcer on his left palm. On examining him, I found the same honeycomb-like appearance present in the skin of both palms and both soles. The ulcer on the left palm had formed as the result of scratching, due to the irritation caused by the infection. Pus could be squeezed out of the

minute pits, and the patient complained of the irritation present. The patient was given unguentum hydrarg. ammoniata and unguentum iodi in equal parts to apply.

The application of oil of turpentine and chloroform is suggested for jigger infection in Manson's *Tropical Diseases*. Would it be advisable in cases such as the above?—Yours, etc.,

PRAPULLA K. BACHASPATI, L.M.F.

JOARI DISPENSARY.

RAJSHAH.

2nd April, 1930

[Possible the cases are instances of keratolysis plantare sulcatum; *vide* the article on this disease by Col. Acton and Dr. McGuire on p. 61 of our issue for February 1930.—EDITOR, I. M. G.]

## A CASE OF (?) SCURVY.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—The following case appears to me worthy of record.

A Mahomedan boy, aged 14, was admitted to this hospital with a history of continuous bleeding of two days' duration from the nose and gums. He had previously had an attack of epistaxis which lasted for two days, and had had malaria six months previously. There was no other history of bleeding, and no history of bleeding among the members of his family. The affected gums were swollen and spongy, with a continuous oozing of venous blood from them. There was no fever, and the pulse rate was 102. The evening after admission the patient commenced to pass a considerable quantity of blood in his urine.

On admission, he was given a calomel powder, followed by a dose of mist. salina. Locally all sorts of styptics were tried, such as liquor adrenalin, tincture ferri perchloride, calcium chloride solution, and an alum gargle. Ice was applied to the head, and calcium chloride and sodium bicarbonate given internally. Nothing however checked the bleeding, his condition gradually became worse, and the pulse was very weak and feeble. Finally, I injected 2 c.c. of hemostatic serum (P. D. & Co.'s preparation). The bleeding now gradually ceased and the urine became normal in two days' time.

My reasons for publishing this case history are the rarity of hematuria in such cases as a complication, and the effect of the hemostatic serum.—Yours, etc.,

NANAK CHAND, L.M.P.

CIVIL HOSPITAL,  
KANBALI, SHEWBO DISTRICT,  
UPPER BURMA,  
27th February, 1930.

## (1) MILK INJECTIONS IN ASTHMA.

## (2) SYMPTOMS DUE TO ASCARIS.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I was much interested in two articles which appeared in your issue for April 1930.

The first was that by Lieut.-Col. Green-Armytage, I.M.S., on the place of non-specific protein therapy in gynecological practice. I have had very good results with milk injections in cases of parametritis (especially those of gonorrhoeal origin), of salpingo-oophoritis and in acute gonorrhoeal arthritis. I have also used the method in asthma, but cannot say very much for its action in these cases, except that it has terminated an attack where adrenalin has failed. I prepare the injection as follows:—The milk is first rendered fat-free by shaking vigorously and removing the fat that comes to the surface. It is then sterilised by boiling on a water bath. The removal of fat prevents the rigor which otherwise occurs.

The second article is the one by Dr. M. Abdulla on severe symptoms due to heavy *Ascaris* infection. I had a case of severe convulsions in a woman aged 42, the intervals between the attacks being as short as half an hour or so. The passage of one round worm after a dose of calomel led me to administer santonin. The



patient then passed a ball of worms, all knotted together, and about a hundred in number. The convulsions ceased almost immediately, and did not recur.—Yours, etc.,

H. T. INCE, L.M.S. (Lond.), I.M.D.,  
Superintendent.

WELLESLEY SANATORIUM JAIL,  
BELLARY,  
2nd June, 1930.

#### A DIFFERENCE OF OPINION.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I would be obliged if you will kindly arbitrate in a matter over which I have recently had what I consider an amazing experience. A medical officer in the course of examination of a case of pleurisy with effusion which had undergone rib resection and drainage, more or less convalescent, found the chest moving well but was unable to hear any breath sounds, for which my explanation was asked. My reply naturally was "a thickened pleura." The medical officer flatly disagreed and made the astonishing statement that in thickened pleura the breath sounds would be augmented. Will you, Sir, undertake to give us the benefit of your opinion?

I think this poor understanding of physical signs in these days of medical education is deplorable.—Yours, etc.,

B. J. BOUCHÉ, M.R.C.S. (Eng.),  
L.R.C.P. (Lond.), I.M.D.

B. M. HOSPITAL,  
CAWNPORE,  
30th May, 1930.

#### PSITTACOSIS OR TYPHOID FEVER?

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—Since reading your interesting editorial on psittacosis in the *Indian Medical Gazette* for May 1930, I have been observing several cases of similar nature occurring in this locality. Altogether I have seen 12 or 13 cases up to this, and I have got 3 cases under my care at present. Although the origin of these cases could not be traced directly from any disease amongst birds, there was a great mortality amongst fowls and crows, only about a few months back. Parrots are seldom found in these parts. So, I am not quite sure whether these cases are in any way related to psittacosis.

The gradual rise of temperature during the first week, its continuance on a high level during the second and third, and gradual fall during the fourth week, were very characteristic. The course was very protracted in all the cases and nothing could cut it short. In mild cases, there was nothing notable besides the continued pyrexia. But in almost all other cases severe complications came on during the latter part of the second week. There was epistaxis in some cases and in one case there was hæmaturia. In almost all cases the bowels remained constipated throughout. Besides a little distension, the gastro-intestinal symptoms were trivial. The spleen and liver were slightly enlarged. The most characteristic feature in almost all the cases was the involvement of the lungs during the latter part of the second week. Signs of bronchitis appeared during this time in almost all cases. In only two cases did I find patches of broncho-pneumonia. Nervous symptoms, too, appeared during this time. Some patients remained delirious for 2 weeks or more.

The more protracted course, the absence of gastro-intestinal symptoms, and the involvement of the respiratory system in almost all cases were very peculiar and made me suspicious about the nature of the disease. The clinical picture in these cases almost convinced me that they were not cases of true typhoid.

The treatment I adopted in these cases was mostly symptomatic. Quinine, which was used in some cases, was quite ineffective. Alkaline citrates and carbonates with urotropin and oil of cinnamon were used with other drugs according to symptoms. Most of the cases

recovered, although they took a pretty long time to regain normal health. A desperate case which I saw on the 15th and 16th day of his illness in a typhoid condition stopped further treatment and died after 2 or 3 days. Another patient who was taken elsewhere on the 14th day of her illness took a serious turn and ended fatally on the 24th day. Besides these two cases all others recovered. No scientific investigation could be made in these cases for want of laboratory facilities.

I send these notes for publication in your esteemed journal and for further light on the subject.—Yours, etc.,

ASUTOSH PAUL, L.M.P., L.T.M.,  
Medical Officer.

P. O. CHILMARI,  
RANGPUR,  
11th August, 1930.

#### EMETINE IN BACILLARY DYSENTERY.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I have read with much interest and surprise the article on "Bacteriophage in its clinical aspect" written by Dr. J. London, appearing on page 370 of your July 1930 number.

The bacillary dysentery cases were cited, in my opinion, in incomplete shape, not only in their bacteriological aspect, but with regard to signs and symptoms too; the only guide for a mofussil practitioner.

Out of 141 cases he was exceptionally fortunate not to meet with a single collapsed case, I have had a dozen of them out of sixty treated with bacteriophage recently, and ten ended fatally. It is not always possible to find the characteristic stools as described in textbooks—viz., thin bloody stools with mucus—in every case of bacillary dysentery. There are instances to prove that the stools often assume the character of rice water, with or without any trace of blood or mucus in it—and the patient sinks with as great rapidity as he does in Asiatic cholera; again on close microscopic examination of the stools no cholera-like vibrios can be detected but the usual appearances of bacillary dysentery are present.

It is an admitted fact that bacteriophage is the best treatment that we are equipped with at present, to confront these sometimes unaccountable enteritis cases.

The marked difference between the two types of dysenteries, both with regard to their signs and symptoms and treatment, is well known to most practitioners but what I cannot understand is the object of arbitrarily giving emetine, the most toxic drug in a case diagnosed as a bacillary type.

Failing to find references in any textbook or leading journal supporting this view, I appeal to your numerous readers and the contributor of this article to throw some further light on the subject and establish an opinion from the scientific point of view.—Yours, etc.,

B. L. DEY, L.M.P.

DOOLAHAT TEA ESTATE & P. O.,  
NORTH LAKHIMPUR,  
UPPER ASSAM,  
13th August, 1930.

[We take it, from a study of Dr. London's article, that he used emetine only in such cases as clinically suggested amoebic dysentery. He points out that full laboratory facilities were not available.—EDITOR.  
I. M. G.]

## Service Notes.

#### APPOINTMENTS AND TRANSFERS.

MAJOR-GENERAL J. W. D. MEGAW, C.I.E., M.B., V.H.S., I.M.S., is appointed Honorary Physician to the King, vice Major-General A. Hooton, C.I.E., I.M.S. (Retired), 16th February, 1930.

His Excellency the Viceroy and Governor-General has been pleased to make the following appointment on His Excellency's personal staff:—

*To be Honorary Surgeon.*

Major-General W. C. H. Forster, M.B., I.M.S., *vice* The Hon'ble Major-General J. W. D. Megaw, C.I.E., M.B., I.M.S., vacated. Dated 26th July, 1930.

The services of Lieutenant-Colonel Clifford, F.R.C.S.E., M.B.C.P., D.S.O., M.C., I.M.S., are placed temporarily at the disposal of the Government of the United Provinces, with effect from the afternoon of the 30th June, 1930.

The services of Lieutenant-Colonel A. J. H. Russell, C.B.E., I.M.S., Medical Assessor with the Royal Commission on Labour, have been replaced at the disposal of the Government of Madras, with effect from the forenoon of the 4th April, 1930.

Major J. B. de W. Molony, O.B.E., M.B., F.R.C.S.E., I.M.S., is appointed to officiate as Assistant Director-General, Indian Medical Service (Sanitary), *vice* Lieutenant-Colonel Hanafin, with effect from the date on which he assumes charge of his duties.

Major H. E. Murray, M.D., M.Ch., I.M.S., is appointed as the First Resident Surgeon, Presidency General Hospital, Calcutta, with effect from the 9th August, 1930, *vice* Major T. H. Thomas, I.M.S., transferred.

The services of Major E. Cotter, I.M.S., are placed temporarily at the disposal of the Government of Burma, with effect from the 2nd July, 1930, for appointment as Assistant Director of Public Health, Burma.

Major J. A. Sinton, V.C., O.B.E., M.B., I.M.S., Director, Malaria Survey of India, is appointed to act as Director, Central Research Institute, Kasauli, in addition to his own duties, during the absence on leave of Brevet-Colonel S. R. Christophers, C.I.E., O.B.E., K.H.P., F.R.S., M.B., I.M.S.

The services of Major S. M. Hepworth, M.B., I.M.S., were replaced at the disposal of the Army Department, with effect from the 7th September, 1929.

The undermentioned appointments are made.

*To be Captain (on probation).*

Captain Michael Henry Wace, 22nd April, 1930, with seniority 27th January, 1927.

*To be Lieutenant (on probation).*

Denis McCarthy, 22nd April, 1930.

The undermentioned officers are confirmed in their present rank.

Captain (Provl.) C. A. Bozman.

Captain (Provl.) M. L. Ahuja.

Captain (Provl.) W. J. L. Neal.

*LEAVE.*

Brevet-Colonel G. D. Franklin, C.I.E., O.B.E., I.M.S., is granted leave on average pay for 4 months, under the Fundamental Rules, with effect from the 30th May, 1930.

Brevet-Colonel S. R. Christophers, C.I.E., O.B.E., K.H.P., F.R.S., M.B., I.M.S., Director, Central Research Institute, Kasauli, is granted leave on average pay for 1 month, with effect from the 1st September, 1930.

Major R. Sweet, D.S.O., M.B., I.M.S., Officer-in-Charge, Medical Store Depot, Bombay, is granted combined leave *ex-India* for 9 months (the first 90 days being privilege leave and the remainder furlough), with effect from the 12th July, 1930, forenoon.

Lieutenant-Colonel D. D. Kamat, I.M.S., Civil Surgeon, Surat, is granted leave on average pay for 8 months, with effect from 15th August, 1930, or subsequent date of availing.

Lieutenant-Colonel J. B. Hanafin, C.I.E., I.M.S., Assistant Director-General, Indian Medical Service (Sanitary), is granted leave on average pay for 1 month and 22 days, combined with leave on private affairs for 23 days, with effect from the 24th July, 1930, or the date from which he may avail himself of it.

Notification No. 452Medl., dated the 8th February, 1930, granting leave on average pay for 7 months, with effect from 25th March, 1930, or date of availing, to Lieutenant-Colonel C. A. Godson, I.M.S., Civil Surgeon, Hooghly, is hereby cancelled.

Major H. E. Murray, M.D., M.Ch., I.M.S., Civil Surgeon, Bakarganj, is granted leave on half average pay for 6 weeks, under Fundamental Rule 81 (d), in extension

of the leave sanctioned in this department notification No. 2147Medl., dated the 30th July, 1930.

*PROMOTIONS.*

The following promotions are made subject to His Majesty's approval:—

*Majors to be Lieutenant-Colonels.*

Dated 28th July, 1930.

J. Scott, D.S.O., O.B.E., M.B., F.R.C.S.E.

F. W. Hay, M.B.

S. M. Hepworth, M.B.

H. S. Cormack, M.C., M.B., F.R.C.S.E.

K. G. Pandalai, M.B., F.R.C.S.

J. L. Sen, M.C., M.B.

C. A. Wood, M.C., M.B.

Dated 30th July, 1930.

P. B. Bhurucha, D.S.O., O.B.E., F.R.C.S.

L. H. Khan.

The undermentioned officer retires:—

Lieutenant-Colonel J. E. Clements, M.B., 25th July, 1930, *not* Lieutenant-Colonel J. C. Clements as notified before.

The promotion of the undermentioned officers to the rank of Major is ante-dated to the dates noted:—

E. T. N. Taylor, M.B. Dated 20th August, 1929.

L. F. Brandenbourg, M.B. Dated 29th January, 1923.

*Captains to be Majors.*

R. C. Wats, M.D. Dated 26th March, 1930.

Hari Das, M.B. Dated 1st July, 1930.

*Lieutenant to be Captain (Provl.).*

T. C. Puri, M.B. Dated 18th August, 1930.

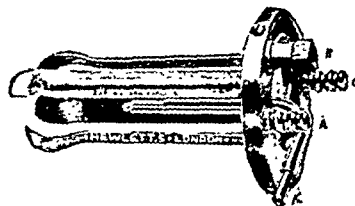
## Notes.

## BARON'S VAGINASCOPE.

Messrs. C. J. Hewlett & Son, 35-42, Charlotte Street, London, E.C. 2, have recently introduced a compact, self-retaining, and illuminated vaginascopes, which will undoubtedly interest all gynaecologists. It is illustrated in the accompanying figure, and the makers give the following description of the apparatus, the cost of which, complete with battery and flex, is £3-17-6.

The need of a more efficient speculum is unquestionable and "Baron's Vaginascopes," which we have pleasure in introducing, in our opinion remedies the defects detailed above and satisfies requirements of modern gynaecology.

*Painless introduction.*—The vaginascopes in its closed form (owing to the manner in which the blades overlap) is of small cross section and can therefore be introduced painlessly into the smallest vagina, the patient being in either the dorsal or lateral position.



*Illumination.*—The inner surface of the lowest blade carries illumination in the form of a bulb which is attached to a battery and flex by a long thin bent tube, the whole of which is removable for sterilizing the instrument itself. By means of a slight up and down movement at 'K' electrical contact is made and broken. Excellent visibility is thus obtained of the vaginal walls, the cervix and fornices.

*Uniform dilation of vagina.*—By loosening screw-knob 'B' and then placing the thumb on peg 'A' and the forefinger on 'B', a single grip effects a simultaneous parallel and outward movement of the four blades resulting in a quick dilatation of the vagina. Sufficient

dilatation having been obtained the screw-knob is tightened thus locking the instrument.

**Self-retaining.**—The free ends of the four blades are advantageously bent so that the assemblage has a bulbous appearance. The additional expansion produced by this means at the inner end of the vagina not only acts as a retaining medium, but also enables the fornices to be more clearly seen.

**No assistant required.**—Owing to the self-retaining properties mentioned above and the electrical illumination which are both incorporated in the instrument, no assistant is required to hold the instrument in place and both hands of the examiner are left free to use additional instruments, etc.

On completion of the examination for diagnostic or therapeutic purposes the screw-knob 'B' is loosened; then gripping 'B' and 'C' a single movement tends to close the instrument which is then easily removable in its partially closed form.

### "PEPTALMINE."

THE treatment of hypersensitiveness to food albumins is a difficult problem, but the work of Vallery-Radot and others has shown that the ingestion of 0.5 gm. of desiccated peptone one hour before each meal may defend the patient against such food sensitiveness. Tyler Brown has confirmed this, and advocates the taking of desiccated peptone in capsules containing 7½ grains, half an hour to one hour before meals. Owing to the hygroscopic nature of desiccated peptone, however, the capsules should be dusted inside and out with starch, and be dispensed in a tightly stoppered container.

"Peptalmine," a product of the Laboratoire des Produits Scientia, Paris, is a preparation designed to meet the needs of such food-sensitive patients. It is stated to contain the desiccated peptones of meat and fish, with extracts of eggs, milk, and wheat flour, and is prescribed in dragées and granules. The Indian agents are Messrs. G. Loucatos & Co., P. O. Box 783, Bombay.

### NEW PREPARATIONS OF PARKE, DAVIS & CO.

SEVERAL new preparations of Messrs. Parke, Davis & Co. will be of considerable interest to our readers. The first of these is "Ventriculin," a stomach-tissue extract. The treatment of pernicious anæmia by liver and liver extracts is now very widely known, but it is not so widely known that treatment by an extract of the mucous membrane of the stomach of animals gives even better results than does liver extract. A detailed report by Isaacs, Sturgis and Smith in the *Journal of the American Medical Association*, 1st December, 1928, gives a very important résumé of this new form of therapy. "Ventriculin" is a dry, granular, palatable substance, which when absorbed stimulates the bone marrow and the production of reticulocytes. Recent reports all confirm the value of this product in the treatment of pernicious anæmia and Addison's disease. The dosage is from 10 to 30 gms. daily, stirred into suspension in water or fruit juice and water. The product is put up in 100 gm. bottles, each provided with a screwed on measure that holds 10 gms.

A second interesting new product is "Irradol"—a solution of irradiated ergosterol in oil, standardized by animal tests to contain one hundred times the anti-rachitic potency of high grade cod-liver oil. It is practically tasteless and odourless, and consequently easy to administer to patients of any age. This preparation is especially indicated in the treatment and prevention of rickets and osteomalacia. It is put up in 10 c.c. vials with a dropper to ensure accurate dosage. For cases of mild and moderate rickets from 15 to 20 drops a day are advised; for osteomalacia and to expectant and nursing mothers 20 drops a day or more.

A third product, "Adrephine," represents a real attempt to provide the patient with something to cure that universal ill to which humanity is heir, the common cold. It is stated that it consists of adrenalin, ephedrine

sulphate, chlorotone, in solution in distilled water, an excellent formula for use as an astringent to the accessible respiratory mucous membranes, in the common cold, hay fever, influenza, etc. The best method of using this preparation is to use it in an atomiser nasal spray. The adrenalin at once clears the stuffiness in the head, after which the much more prolonged action of the ephedrine comes into play and soothes the congested mucous membrane for some hours. Until the medical profession discovers the true cause of the common cold, and how to prevent and cure it, we suppose that such preparations as this are the best remedies to hand. We have personally tried "Adrephine" and have found that it gives the greatest relief.

A fourth interesting product is a general tonic, "Metatone." This is stated to consist of an active vitamin B extract with nucleic acid, and the glycerophosphates of calcium, potassium, sodium, manganese and strychnine. It has an aromatic flavour and is very pleasant to take. Its general formula indicates its use as a tonic in convalescence, neurasthenia, anæmias, during lactation, and especially for children and the aged. The dose for an adult is 1 to 2 teaspoonfuls, and the preparation is supplied in 12-oz. bottles.

Messrs. Parke, Davis & Co., P. O. Box 88, Bombay, ask us to inform our readers that they will be glad to supply literature and information with regard to these products on application.

### "KUTAGINE."

THE kurchi treatment of amœbic dysentery is still rather in the experimental stage, but the number of preparations from this drug now on the market is considerable. One of the latest is "Kutagine," prepared by the Synthetic Drugs Laboratory, Ltd., 1, Ratan Babu Road, Cossipore, Calcutta. This is stated to be a solution of the hydrochlorides of the active principles, both alkaloid and non-alkaloid, of kurchi bark, and is put up in ampoules of 1/2 and 1 grain in 1 c.c. for hypodermic administration. Reports claim that the injections are almost painless, that no induration follows, and that this line of treatment is of value, not only in cases of amœbic dysentery, but also in bacillary dysentery and cholera.

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## Original Articles.

### A SUGGESTED STANDARD TREATMENT OF MALARIA BASED UPON THE RESULTS OF THE CONTROLLED INVESTIGATION OF OVER 3,700 CASES.

By J. A. SINTON, M.D., D.Sc.,

MAJOR, I.M.S.,

*Director, Malaria Survey of India, Kasauli.*

DURING the past nine years the Indian Research Fund Association has financed a Quinine and Malaria Enquiry, the major portion of whose work has been concerned with the investigation of different methods of treatment of malaria. Most of the results of these researches have been published in various articles in the *Indian Journal of Medical Research* and, in order that these may be more readily available to clinicians, it is here proposed to give a summary of the main findings and, having discussed these, to suggest a standard treatment of malaria based upon them.

In the formulation of a standard treatment of any disease one should commence with a clear idea of the object aimed at and the solution of the problem should be of a practical nature. The chief factors to be considered in any ideal treatment of the malarial fevers are detailed below, for it must be remembered that there is not one "malarial fever" only but at least three—benign tertian malaria, malignant tertian malaria and quartan malaria. These factors deal with the treatment of persons infected with malarial parasites and do not consider especially the wider question of the prevention of malaria infection, although it seems probable that, if the ideal drug could be discovered, one very practical solution of the malaria problem would be reached.

The ideal treatment should have the following characters:—

(a) It should bring about a rapid cessation of the symptoms complained of by the patient, and of any acute condition due to the disease which is likely to endanger his life.

(b) It should cause no harm to the patient.

(c) It should destroy all the parasites in the body, or, at least, bring about such a condition that the natural defences of the body can complete the destruction, thus preventing the recurrence of clinical symptoms with re-invasion of parasites at a later date.

(d) It should rapidly destroy or make non-viable all the sexual forms of the parasite in the peripheral blood and prevent their reappearance there, i.e., prevent the patients becoming potential sources of mosquito infection.

(e) It should, if possible, be effective against all the different species of malaria parasite, for many physicians have not the time nor the

facilities for accurate parasite diagnosis, and even with such examinations mixed infections may be overlooked.

(f) It should be capable of use on a large scale amongst any ignorant, poor and uncontrollable population, such as is common in the tropics. For this purpose it should, therefore, (i) be cheap in price, (ii) have little taste or disagreeable effects, (iii) require little expert medical supervision and (iv) produce a permanent cure in a few days, for such a population will usually not return for further treatment after the cessation of clinical symptoms.

Unfortunately the ideal drug has not yet been found, so one must consider how far the remedies at present known fulfil the ideal requirements, and how far their effects may be combined to achieve the best results. The three chief classes of remedy which are generally agreed to be of most use in the treatment of malaria are the cinchona alkaloids, the arsenical preparations, and plasmoquine, so it is necessary to consider these separately.

The only method which has been found absolutely certain for the diagnosis of malarial infection has been the finding of malarial parasites in the blood and this has been the method on which all the cases recorded here were diagnosed. The routine procedure for testing various drugs has been given in detail by Sinton (1926a) to which article those interested are referred.

The British patients were adult soldiers and the Indians adult prisoners in the Lahore Central Jail. The infections among the British cases were nearly all of a very chronic character, while those among the Indians showed a very high proportion of fresh ones.

#### *The Cinchona Alkaloids.*

The chief alkaloids of cinchona bark which have been used in medicine are the four crystallizable alkaloids—quinine, quinidine, cinchonine and cinchonidine—and the amorphous alkaloid, quinoidine. These alkaloids have been used either separately in the form of their salts, or as that mixture of the total alkaloids of the bark, which is known as cinchona febrifuge or kinetum.

The effects of these drugs may be considered under the following headings:—

(a) Their effects in the production of cure in the different forms of malarial fever.\*

(1) Production of a clinical cure.

(2) Production of a permanent cure.

(b) Their effects on gametocytes.

When the effects of the different alkaloids has been evaluated it is necessary to consider:

(c) Which alkaloid is most suitable for routine treatment?

\*Unfortunately the number of cases of quartan malaria seen was too few from which to draw any reliable conclusions, so the results given here refer to benign tertian and malignant tertian fevers only.

(d) Which salt of the alkaloid should be used?

(e) The best method of administration.

(f) The best time of administration.

(g) The best dosage and duration of treatment.

The alkaloids tested were quinine, quinidine, cinchonine, cinchonidine and cinchona febrifuge. The amorphous alkaloid quinidine was not investigated, as previous workers had found that this drug was, in medicinal doses, the least effective of the alkaloids and was inclined to give rise to disagreeable symptoms. The crystallizable alkaloids were used in the form of their sulphates and cinchona febrifuge\* in its amorphous form. The maximum daily dosage of quinine and cinchona febrifuge was 30 grains, and with the other three crystallizable alkaloids the dose was 20 grains daily. In the case of cinchona febrifuge it must be remembered that this mixture of alkaloids only contains about 50-55 per cent. of crystallizable alkaloids as compared with 72.8 per cent. in quinine sulphate.

#### A. EFFECTS OF THE CINCHONA ALKALOIDS IN THE PRODUCTION OF CURE IN THE DIFFERENT FORMS OF MALARIAL FEVER.

The term "cure" has been used in two very different senses in the literature of malarial therapy, first to mean a cure of the clinical symptoms, and second to mean a complete and permanent destruction of the malarial infection. It is therefore necessary to consider clinical and permanent cures separately.

##### (1) The production of a clinical cure.

The factors which were used in estimating the effects of the different cinchona alkaloids in the production of a clinical cure, were the following:—(a) the effects of treatment on fever, (b) the effects on removing the parasites from the peripheral blood, and (c) the effects on splenic enlargement.

##### (a) Effects on fever.

(i) The term "fever" has here been used to denote an oral temperature of 99.5°F. or over, and the "duration of fever" to be the interval which elapsed between the first administration of treatment and the time when the temperature fell below this level and remained down with no further febrile rise during treatment. The temperatures were taken at 7 a.m. and 4 p.m. The "duration of fever" was measured in periods of half a day.

Table A shows the "average duration of fever" among 1,401 cases of malignant tertian malaria and 1,846 of benign tertian treated with different cinchona alkaloids.

\*The approximate composition of the cinchona febrifuge used in these investigations is given in Appendix A.

The number of cases of malignant tertian malaria treated with quinidine was too few from which to draw conclusions. The results with quinine sulphate and cinchona febrifuge are slightly in favour of the former drug, which may be accounted for by the larger amount of crystallizable alkaloids which it contains, and which may not be compensated for by the quinidine content of the cinchona febrifuge.

The results among the benign tertian cases do not show any one of the alkaloids as being pre-eminently superior to any other.

TABLE A.

Average duration of fever after the commencement of treatment.

Disease.	Drug.	Total cases.	Average duration. (Days.)
† MT	‡ Q	1,156	0.55
MT	QD	20	0.32
MT	CF	225	0.73
Total	..	1,401	0.57
BT	Q	1,183	0.37
BT	QD	267	0.34
BT	CC	83	0.30
BT	CD	125	0.23
BT	CF	188	0.32
Total	..	1,846	0.35

† In this and the other Tables "MT" stands for infection with *P. falciparum* (malignant tertian malaria) and "BT" for infection with *P. vivax* (benign tertian malaria).

‡ In all the Tables "Q" denotes quinine, "QD" quinidine, "CC" cinchonine, "CD" cinchonidine and "CF" cinchona febrifuge.

(ii) Although the "average duration of fever" is one method for the comparison of the clinical effects of different drugs, one must also consider the "maximum duration of fever" among these cases, for so much has been written about "quinine-resistant" cases of malaria. During these investigations on malarial treatment made during the past nine years, a small number of cases have been observed in which the febrile symptoms did not react rapidly to treatment with the cinchona alkaloids, but in every instance it was found that the malarial infection was complicated by some other disease which accounted for the continuance of the fever. Cases suffering from pneumonia, cerebro-spinal meningitis, enteric fever, pulmonary and renal tuberculosis, dengue, etc., as concomitants of malarial infection have been observed, and, when one considers the frequency of this infection in India, it is not to be wondered at that malaria should be found concurrently with other ailments. Malaria may complicate or be complicated by any disease known to medical science, and in every case of apparent clinical "quinine-resistance" seen during these investigations, such complications

have been the cause, and no true resistance has been observed when quinine was properly administered in medicinal doses.

Among the 1,401 cases of uncomplicated malignant tertian malaria observed, in only 7 instances did fever last more than 5 days, and the maximum was 6 days. All the latter cases occurred at a time when an epidemic of dengue was present, so the more prolonged fever may have been accounted for by complication with this disease, which is practically impossible to diagnose in the presence of malarial infection. Among the 1,846 cases of benign tertian malaria, only 18 showed fever lasting more than 3 days and none more than 4½ days. All the latter instances occurred among Indian prisoners who usually take every means possible to avoid the bitter alkaloids, even to the extent of inducing vomiting by mechanical means. When, however, special precautions were taken in the administration of treatment to such cases, the fever at once subsided. As with the malignant tertian cases, no true instance of clinical "quinine-resistance" was found although a strict watch was kept in an endeavour to discover such cases.

(b) Effects on the Persistence of Asexual Parasites in the Peripheral blood.

Under the conditions of investigation it was not found possible to make daily blood examinations after the commencement of treatment, but these were made by the thick-film method in all cases at the end of each week of treatment or at the end of treatment if this lasted less than one week.

The results of these examinations have been summarised in Table B.

TABLE B.

*Persistence of parasites in the Peripheral Blood.*

Disease.	Drug.	Time of examination.	Total cases.*	Percentage positive.
MT	Q	3rd to 6th day.	1,133(I)	3.3
MT	Q	7th day	106(B)	Nil.
MT	QD	7th day	20(I)	Nil.
MT	CF	5th day	246(I)	2.4
Total.			1,505	2.8
BT	Q	4th to 6th day.	333(I)	2.1
BT	Q	7th day	883(B)	0.23
BT	QD	7th day	46(I)	Nil.
BT	QD	7th day	220(B)	Nil.
BT	CC	7th day	82(B)	1.2
BT	CD	7th day	120(B)	Nil.
BT	CF	4th day	44(I)	Nil.
BT	CF	7th day	145(B)	Nil.
Total.			1,873	0.53

\* In these totals "B" means British patients and "I" Indian.

The results among British cases have been shown separately from Indian, as the former were mainly chronic infections and the latter fresh ones.

The results go to show that all the crystallizable alkaloids have a strong parasitocidal power in malaria but no one seems markedly superior to any other. During the whole course of the investigations, no case of parasitic "quinine resistance" could be found, when the alkaloids were administered properly and in medicinal doses, but the parasites seemed to persist longer in fresh infections than in chronic ones.

(c) Effects on Splenic Enlargement.

Splenic enlargement was measured in finger-breadths of projection beyond the costal margin, while the patient was in the recumbent position. The "average spleen" was estimated by giving palpable spleens a value of 1, spleens of one finger-breadth of enlargement 2, and so on.

(i) Splenic index. Table C shows the splenic indices before and after treatment with the different alkaloids, and although quinine has shown better results than the other alkaloids the differences are not such as to prove it markedly superior.

TABLE C.

*Effects of treatment on the Splenic Index.*

Disease.	Drug.	Total Cases.	SPLENIC INDEX.	
			Before. (Percentage.)	After. (Percentage.)
MT	Q	429	39.4	26.8
MT	CF	239	30.1	21.4
BT	Q	661	51	7.5
BT	QD	204	54	7.8
BT	CC	76	27.6	4
BT	CD	110	25.5	6.3
BT	CF	136	47	9.5

(ii) Average spleen. The results of treatment are summarised in Table D, and the same remarks as those on splenic index may be made.

TABLE D.

*Effects of treatment on average size of spleen.*

Disease.	Drug.	Total Cases.	AVERAGE SPLEEN.	
			Before.	After.
MT	Q	352(I)	1.00	0.84
MT	Q	72(B)	2.15	0.63
MT	CF	239(I)	1.00	0.74
BT	Q	661(B)	1.35	0.12
BT	QD	204(B)	1.41	0.16
BT	CC	76(B)	0.63	0.07
BT	CD	110(B)	0.85	0.12
BT	CF	136(B)	1.21	0.19



### (d) Conclusions on Effects of Treatment on Clinical Cure.

The effects of the different alkaloids in the temporary amelioration and abolition of the clinical manifestations in both benign and malignant tertian malaria have been very similar. Quinine appears to give slightly better results than the other alkaloids, but this may be due to the slightly larger amounts of total alkaloids given daily. The results do not show that any one alkaloid or combination of alkaloids is markedly superior to any other in the production of a clinical cure in ordinary cases of malaria, when proper medicinal doses are given.

### (2) Production of a Permanent Cure.

The results of these investigations have already been published and full details are given in the original articles (Sinton, 1926b; Sinton and Bird, 1929; Sinton, 1929).

The criterion of "permanent cure" used has been the absence of parasites from the peripheral blood during eight careful weekly examinations of the blood by the thick-film method after the cessation of all treatment. By this method it has been found that about 95 per cent. of possible relapses are detected, (Sinton, 1926a; 1926b). The precautions used in testing the different treatments are detailed in the same articles.

Table E summarises the results obtained by treatment with the different alkaloids. In this table fresh and chronic infections have as far as possible been recorded separately, because it was found that fresh infections with *P. vivax* were much more easily cured than were chronic ones.

TABLE E.

Effects of treatment on Permanent Cure.

Disease.	Drug.	Total Cases.	Type of infection.*	Average relapse rate. (Percentage.)
MT	Q	575	F & C	39
MT	CF	239	F & C	46
BT	Q	164	Mainly F	29
BT	Other alks	43	Mainly F	42
BT	Q	667	C	68
BT	QD	208	C	83
BT	CC	72	C	67.6
BT	CD	107	C	68.7
BT	CF	110	C	73.1

\* "F" denotes fresh infections and "C" chronic ones.

Quinine treatment proved slightly superior to cinchona febrifuge in the production of a permanent cure in malignant tertian malaria but this, again, may have been due to the smaller amount of crystallizable alkaloids in the latter drug. No differences could be detected in the case of cure in fresh as compared with chronic infections.

Fresh infections with benign tertian malaria were found to give a higher cure rate than chronic ones, but the number of cases treated with alkaloids other than quinine in the former instance were too few upon which to generalize as to their relative values. Among chronic cases the results obtained were very similar with the various alkaloids, except that quinine seemed slightly inferior in this respect.

### (3) Conclusions from the effects of treatment in the production of a cure in malarial fevers.

The results given above strongly support the view that, in proper medicinal doses, all the crystallizable cinchona alkaloids are of an almost equal value in the production of a clinical cure in ordinary cases\* of malarial fever. This is what is primarily demanded by the patient, who in many, probably the majority of, instances will not willingly continue treatment when clinical cure has been attained.

As far as these investigations go, they show that the cinchona alkaloids will produce a comparatively high percentage of permanent cures in malignant tertian malaria and in fresh benign tertian infections. The cure rate in chronic infections with the latter fever is very disappointing, irrespective of the alkaloid used or the method of treatment.

### B. EFFECTS OF TREATMENT ON GAMETOCYTES.

In the case of benign tertian malaria the records of the persistence of parasites in the peripheral blood summarised in Table B include the gametocytes of *P. vivax*. It will be seen from this that the sexual forms of these parasites are very rapidly destroyed by treatment with the cinchona alkaloids. Unfortunately this is not the case with the gametocytes of *P. falciparum*. This defect in the cinchona alkaloids has been recognised for many years and an investigation made into this point (Sinton, 1926c) showed that crescents may persist in the peripheral blood for as long as 6 weeks after a permanent cure has been effected, although in the majority of cases they had disappeared after 3 weeks.

### C. WHICH ALKALOID IS MOST SUITABLE FOR ROUTINE TREATMENT?

In the light of the knowledge gained from the experiments summarised above and from the experiences of other workers both in India and elsewhere, certain points in the general policy of the treatment of malaria by the cinchona alkaloids may be considered:—

(a) Is the patient in immediate danger of death? In such case quinine would seem to be the alkaloid of choice.

\*In this article the cases referred to are the ordinary ones usually met with in general practice and not those pernicious cases in which special forms of treatment, such as intravenous injection, are necessary.

(b) Will the patient continue treatment long enough to obtain a permanent cure? The ordinary patient in the tropics will only continue to take the cinchona alkaloids for a period sufficient to produce a clinical cure because (i) these drugs are unpleasant to take, (ii) being a poor man, he is unable to spare the time to come for prolonged treatment or the money to purchase it and (iii) often being uneducated he does not realise the importance of continued treatment after the physical distress of his attack has been ameliorated. Indeed in some hyperendemic areas a permanent cure of one infection is almost immediately followed by reinfection. Under such conditions a clinical cure is all that can be hoped for in the majority of cases, and for this any of the crystallizable alkaloids seem to have an almost equally beneficial effect.

(c) Is the expense of treatment an important factor?

If expense is important the choice of alkaloid would lie between quinine and cinchona febrifuge. For those who can afford it, quinine being slightly more palatable and slightly less liable than cinchona febrifuge to cause unpleasant symptoms, seems the drug of choice. For poorer patients the cheaper cinchona febrifuge would meet all requirements.

(d) Are any of the alkaloids likely to harm the patient?

The use of quinine and cinchona febrifuge in the routine treatment of malaria has been so universal that their harmlessness in medical doses has been established. Quinidine unfortunately has a marked depressant action on the heart, while several workers have noted that cinchonine is more toxic than quinine. Cinchonidine appears to have a low toxicity. As none of the three last alkaloids have been found markedly more efficacious than quinine or cinchona febrifuge, the choice for routine treatment would seem to lie between quinine and cinchona febrifuge.

#### D. WHAT SALT OF THE ALKALOIDS SHOULD BE USED?

It is now known that only very small amounts of these alkaloids are absorbed from the stomach but that the majority of absorption occurs in the intestine. What apparently happens is that when the salts of the alkaloid leave the stomach in solution they are precipitated by the alkaline contents of the small intestine in the amorphous form and then absorbed.\* It is clear from this that, irrespective of what salt has been given originally, the same result is obtained when the duodenum is reached, provided that the drug is in solution when it leaves the stomach. This conclusion is borne out by the very numerous experiments carried

out during the war and afterwards, in which it was found that no one salt was superior to any other in the production of a permanent or a clinical cure, if it was absorbed by the body.

It is in respect of the latter point that differences have been found in the value of the different salts. If the alkaloidal salts are given in solution little, if any, difference is found, with due consideration of course to the varied total alkaloidal content of the different salts, but if they are given in the form of pills, tablets or powders, marked differences may be noted. The more insoluble forms may pass through the stomach without coming into complete solution and are therefore not in a condition suitable for precipitation and complete absorption in the intestine. This effect is aggravated by the fact that numbers of malarial patients suffer from achlorhydria or hypochlorhydria and so the chances of the drug becoming dissolved in the stomach are greatly diminished. It is therefore apparent that the cinchona alkaloids should be given in solution or in the form of very soluble salts such as the bihydrochloride and bihydrobromide. These should be followed by copious draughts of water to ensure solution and at the same time to prevent the gastric irritation which often follows their administration in the solid or concentrated form, when they may have a caustic action on any delicate mucous membrane with which they come in contact. The copious fluid also aids absorption.

As far as the quinine salts go the sulphate is probably the salt of choice for routine work, on account of its cheapness and because it contains about 72.8 per cent. of the quinine alkaloid as compared with 74.8 per cent. in the more expensive bihydrochloride and 58 per cent. in the bisulphate.

Many instances of so-called "quinine-resistance" are probably due to the administration of insoluble salts or of soluble salts in an insoluble form, such as pills, tablets, etc., which are also much more easily evaded than are solutions.

#### E. THE BEST METHOD OF ADMINISTRATION OF THE ALKALOIDS.

The chief methods of administration which have been used for the treatment of malaria have been the intravenous, the subcutaneous or hypodermic, the intramuscular, the rectal and the oral.

The intravenous method is a very valuable one in the treatment of pernicious and comatose cases. Its effects are usually the most rapid of all in the abolition of clinical symptoms, but the majority of workers have not found that it is more likely to produce a permanent cure than the other methods. Such a method can seldom be used for treatment outside hospital practice.

\*Some observers think the good results obtained with cinchona febrifuge depend largely on its amorphous character.

The subcutaneous or hypodermic method in the majority of instances causes marked sloughing of the tissues, which may involve the skin. The dangers of tetanus are similar to those following intramuscular injection.

The intramuscular method has a large number of advocates, who assert that this mode of administration gives superior clinical results to the oral one; indeed Willecox (1919) concluded that this method was ten times more efficacious. It has not however been found that this method gives superior results to the oral one in the production of a permanent cure. As the work of various observers goes to show that absorption by this route is slower than by the mouth, one must search for an explanation of the superiority claimed for it.

The majority of advocates of the intramuscular method are those who record that with oral administration they get "quinine-resistant" cases, which only yield to such injections. The danger of tetanus from this method is well-known, with the result that when this mode of therapy is used the physician takes the greatest care in the preparation and injection of his dose and does not leave it to his subordinates. This ensures that the prescribed amount of the drug actually enters the body and is retained there. Now in the case of oral administration the usual procedure is to order a certain dose of the drug and then assume that this will be properly compounded, administered and retained by the patient, but unfortunately this is not so. The medicine, however, may not be of the strength prescribed, the patient may avoid taking it or may not take the prescribed amount, and even if he has taken it he may not retain it. Several workers have discussed these fallacies in detail, pointing out that many of the stock medicinal solutions are not of the prescribed strength (Sinton, 1925; Megaw, Ghosh and Chatterjee, 1928) and emphasizing the necessity for ensuring that the drug is actually taken and retained by the patient (Fletcher, 1923; Sinton, 1926a). In my opinion if as much care were taken to see that patients received, retained and absorbed the prescribed amounts of the drug orally, as is used for intramuscular injection as good or better results would be obtained and the number of the so-called "quinine-resistant" cases would rapidly diminish. Fletcher (1923) has also discussed this aspect of the subject and arrived at the same conclusions. During the treatment of over 3,700 cases recorded here, it was never found necessary to use intramuscular medication and no "quinine-resistant" cases have been found (Sinton, 1926a, 1926b). The vaunted superiority of the intramuscular method seems to depend entirely on the fact that the greatest care is used to ensure that the prescribed dose of the drug is taken and retained, while the patient escapes the unpleasant taste of the drug.

Even assuming that this method of administration gives as good or better results than the oral, it has been shown by many workers that the strength of quinine ordinarily used in such injections gives rise to a very marked necrosis of the tissues into which it is given (Fletcher, 1923; Acton and Chopra, 1924). As such tissues are deeply situated there are few or no signs on the surface to indicate the damage done. Another grave drawback to such injections, as a routine or standard method of treatment, is the danger of tetanus, which is a real one, although the protagonists of this method appear to consider the risk as trivial if proper precautions are taken. Unfortunately the number of instances of tetanus is much greater than published accounts would indicate. Even within the last couple of years unpublished information of five such cases has come to my notice. During a large experience of malarial treatment, it has never been found by me necessary to give an intramuscular injection for this disease and in my opinion there seems only one indication and that is in those very rare comatose cases, usually children, where oral administration or intravenous injections are found impossible.

The rectal route is seldom used except in the case of infants, and some workers (Fletcher, 1923) believe that it causes such great irritation that it is of little practical value. It is certainly unsuitable for routine treatment.

There is no doubt that the oral method of administration is that of choice for routine treatment and, except in pernicious or comatose cases, has been found as good if not better than any other. The use of this method may be discussed under the following headings:— (a) administration and (b) retention of the drugs.

(a) *Administration*.—The unfortunate fact that solutions of the cinchona alkaloids are sometimes much weaker than the prescribed strength has been pointed out above, and simple methods for testing such solutions have been devised by Sinton (1925) and Megaw, Ghosh and Chatterjee (1928). Even pills and tablets may fail to contain the amounts of the drug stated to be present, or may be so insoluble that a medicinal dose of the drug is not absorbed after ingestion.

Assuming that the compounder has used the proper amount of the drug, what method of solution is best? In the past it has been the custom to employ one of the mineral acids, such as dilute sulphuric or hydrochloric, for this purpose. It was pointed out by Sinton and Bailly (1924) that a varying degree of "acidosis" was associated with malarial attacks; if, therefore, a mineral acid is prescribed this condition will be increased. The use of citric acid as a solvent of the alkaloid avoids such an eventuality because this acid is absorbed into the body as an alkali. It will thus tend to

diminish and not increase the condition of lowered alkali reserve. Another drawback to the mineral acids, more especially sulphuric, is the damage to the teeth and the gastric irritation which may follow their prolonged use. Renal irritation also may follow the use of mineral acids but not of organic ones like citric acid.

One of the great disadvantages of the cinchona alkaloids is the bitter taste, which it is almost impossible to disguise.\* Patients, therefore, will try to avoid taking these drugs and the mere fact that a patient asserts that he has taken the prescribed amount is unfortunately in many instances poor evidence of fact. One can never be certain unless the administration has been supervised by a reliable person, who has actually seen the drug swallowed. This fallacy is probably the cause of numerous "quinine-resistant" cases (Sinton, 1926a).

(b) *Retention of the drug.*—Even when the drug has been taken in the prescribed doses it may be vomited, either voluntarily or involuntarily. The former was a favourite practice among prisoners who objected to the symptoms of cinchonism, when their clinical distress had been relieved.

The involuntary vomiting of the cinchona alkaloid during an attack of malaria is in my opinion usually a symptom of the "acidosis" present. It seems an attempt by the body to get rid of acid by the expulsion of acid gastric contents, much more than the result of any irritating effect of the drug. The usual means advocated to overcome this complaint are to wash the stomach out with an alkaline solution and give a sedative. If the alkaline solution described later is administered there is no necessity to wash out the stomach, for if the patient again vomits he washes out his own stomach. In many cases the use of such an alkaline solution, repeated if necessary, has been found sufficient to check this symptom. In those instances where vomiting is severe, the oral administration of 20 minims of adrenalin solution (1 in 1000 strength) by the mouth, repeated if necessary, has never failed to permit of the use of the cinchona alkaloids by the mouth. The result has been that it has been possible to use oral administration in all the cases reported in this article. This has been the case even with those very frequent instances of patients who say they cannot take quinine on account of vomiting. Such patients, when given adrenalin and then the alkaloid under the name of "methyl cuprein" or "cinchona alkaloid" to exclude the effects of suggestion, have been treated with uniform success. Intravenous injection has only been necessary for comatose patients or where the condition of the patient is so serious as to indicate the immediate

necessity for specific medication by the most rapid route possible.

#### F. METHODS OF OBTAINING THE OPTIMUM ACTION OF THE ALKALOIDS.

The optimum action of these alkaloids cannot be obtained unless they are properly absorbed, and there are certain adjuvants which appear to increase their therapeutic value.

(i) *Absorption.*—The question of absorption from the intestine has been discussed already, but this portion of the alimentary tract is not always in a condition favourable to the optimum absorption of the drugs, even when they arrive there in a form suitable for complete and rapid disposal.

Among the causes responsible for the ineffective action of the cinchona alkaloids on clinical symptoms, and for many instances of so-called "quinine-resistance," is that the alimentary mucosa may be coated with mucus, it may be disordered with the occurrence of diarrhoea or constipation, and the liver may be sluggish. This congestion and irritation of the intestinal tract is often the direct result of the malarial attack and its extent can usually be gauged by the condition of the tongue. The detrimental effects of such alimentary conditions are almost universally recognised and, in most of the recommended treatments of malaria, stress is laid upon the preliminary use of calomel followed by saline purgation before commencing any specific treatment, in order to diminish such obstacles to absorption. There is no doubt that this is an essential feature of any treatment of malaria. Unfortunately, it is not usually followed up by keeping the bowels freely open. The routine daily use of salines with the alkaloidal medication helps to keep the intestinal mucosa clear of matter which will hinder absorption, and it assists this process by increasing the flow of bile, while any purgation resulting helps to relieve the condition of "acidosis" present, thus aiding the action of the specific drug.

During the investigations summarised here the effects of the routine administration of small doses of magnesium sulphate with each dose of the cinchona alkaloids were compared with the effects produced when this adjuvant was not used. Among 844 malignant tertian cases receiving routine saline the average duration of fever was 0.50 days as compared with 0.68 among 577 cases not receiving daily salines, while all the cases with a maximum duration of fever over 5 days occurred in the latter series. Among 1,747 benign tertian cases given salines the average duration was 0.35 days as compared with 0.65 among 99 who did not get them. Only 0.7 per cent. of cases in the former series had a maximum duration of fever over 3 days, as compared with 6 per cent. in the latter.

Parasites were found to persist in only 1.1 per cent. of 923 malignant tertian cases on saline treatment, as compared with 5.6 per cent. of

\*The drinking of milk or the chewing of bread help to remove the taste from the mouth.

582 cases not receiving this treatment. Among two series of 1,768 and 105 benign tertian cases the figures were 0.3 per cent. and 4.8 per cent. respectively.

These results when considered together go to prove the beneficial effects of the routine daily administration of salines in the treatment of malaria by the cinchona alkaloids.

(ii) *Alkalies as Adjuvants*.—The use of alkalies as adjuvants to the action of quinine was pointed out by Sinton (1923a; 1923b). The reasons for this method of treatment were based on the theories that alkalies would be beneficial (1) by assisting the natural defences of the body; (2) by alleviating the "anaphylactoid" symptoms of the malarial paroxysm; (3) by combating the tendency to "acidosis"; (4) by making the reaction of the body fluids more favourable for the optimum parasitocidal action of the cinchona alkaloids, and (5) by helping to relieve the symptoms of cinchonism. Many workers have reported favourably on this method of treatment and Acton and Chopra (1925) believe that part, at least, of its beneficial action may be due to the increased absorption of the drug which the alkali facilitates.

When the alkaline treatment was given to 724 cases of malignant tertian fever the average duration of fever was 0.52 days as compared with 0.63 among 667 who did not get alkali, while all the cases with a maximum duration of fever over 5 days occurred in the latter series. Among fresh infections of benign tertian malaria alkalies seemed to be distinctly beneficial (Sinton, 1923a), but in the chronic ones little difference was noted.

The percentage of malignant tertian cases with persistent parasites among 783 given alkali was 1.0 as compared with 4.8 among 722 who did not get this adjuvant. Among two series of 697 and 1,176 cases of benign tertian malaria the percentages were 0.14 and 0.80 respectively. Sinton (1926c) has also shown that the disappearance of crescents is more rapid when alkali is used.

Among 351 cases of malignant tertian malaria given alkali, the spleen rate fell in a week from 37.3 per cent. to 21.4 as compared with 34.7 and 28.7 per cent. among 317 controls. The figures for 401 benign tertian cases were 57 per cent. before and 5.5 at the end of treatment and among 786 controls the results were 48 and 7.5 per cent. respectively.

The average spleen in the alkaline malignant tertian series fell from 1.15 to 0.66 as compared with 1.12 to 0.92 in the control series. Among the benign tertian series the average spleen in the alkaline cases dropped from 1.53 to 0.10 at the end of treatment, while among the controls the reduction was only from 1.12 to 0.15.\*

\* Hughes and Shrivastava (1930) think this accentuation of the action of quinine on the spleen is probably connected with increased tonicity of smooth muscle caused by a rise in pH.

The relapse rate among 457 malignant tertian patients given alkali was about 30 per cent. as compared with 60 per cent. among 357 who did not get this adjuvant. Among benign tertian infections, chiefly fresh, the relapse rate was 24.5 per cent. among 97 treated with alkali, while 95 controls had 37 per cent. relapses. Very little difference could be found between the effects produced in chronic cases.

These figures show a distinct advantage in the use of alkalies as an adjuvant to the clinical cure of malarial manifestations and to the permanent cure of malignant tertian malaria and, at least, of fresh infections of benign tertian.

#### F. TIME OF ADMINISTRATION.

Some physicians recommend that treatment with the cinchona alkaloids should be withheld until the febrile symptoms of the disease have abated. There is no doubt that the disagreeable effects of these drugs are less marked when the acute symptoms of the disease have passed off, and it is possible that the action of the drugs may be better when the "acidosis" of the fever has diminished. There is often, however, a period of several days before the temperature comes to normal and, especially in malignant tertian malaria, one cannot safely risk the danger of the development of pernicious manifestations by withholding specific treatment for this time, apart from the debilitating effects caused by the untreated disease.

Other workers recommend that the alkaloids should be given very shortly before the malarial paroxysm is expected, to ensure that the drug shall be at its maximum concentration in the blood at the time when the most vulnerable form of parasite, the young trophozoite, is present there. Although this may be a counsel of perfection, it is difficult in practice to determine as a routine measure the exact moment of segmentation and valuable time may be wasted in the attempt. Again where large numbers of patients are being dealt with such a method means that medicines are being given to patients at all hours of the day and night, which is not a very practicable proposition in most instances, and is unsuitable for routine work.

There is no doubt that in all cases where dangerous or very severe manifestations are present, specific treatment should be started as soon as a diagnosis is made, even before the necessary preliminary purgation and alkalisation has taken effect. In all ordinary cases one can usually wait until the preliminary purgation has taken effect and the routine alkali has been given before commencing cinchona treatment.

#### G. BEST DOSAGE AND DURATION OF TREATMENT.

Thomson (1917) and Ross (1921) report that a dosage of 5 grains of quinine daily is insufficient to prevent relapse. Bass (1922) states that

10 grains daily was enough to prevent relapse as soon as the acute symptoms had been relieved, while Fraser (1919) found that so long as a daily dosage of 15 grains was continued no relapse occurred. Over 600 patients suffering from chronic benign tertian malaria were seen in this enquiry, and to these 10 grains of quinine was given daily after the temperature had returned to normal. In no case did a relapse, either clinical or parasitic, occur over periods of many weeks, so long as this dosage was given and retained.

These observations show that doses of 10 to 15 grains of quinine daily when properly administered will control the febrile manifestations of malarial infection in most, if not all cases, but many of these cases relapse as soon as such daily treatment is discontinued. Such a dosage is therefore below the therapeutic optimum.

In some European countries the maximum daily dosage of quinine recommended seems to be 20 grains, but it must be remembered that in these countries benign tertian is the predominant infection and such doses can be given with safety. In the tropics, however, where malignant infections are much more common, most authorities recommend a daily dosage of, at least, 30 grains, on account of the dangers of the development of pernicious symptoms. Although in our investigations it was found that doses less than 30 grains daily would have a considerable curative effect on benign tertian malaria, in at least as far as clinical manifestations are concerned, a daily dosage of 30 grains is considered to be the optimum, consistent with curative action and the avoidance of harm and excessive discomfort to the patient. This dose seems to be that most usually recommended for the treatment of acute attacks of malaria in the tropics irrespective of the kind of infection. In our work the cure rate in malignant tertian malaria treated with quinine in doses of 20 grains daily was less than half that with 30 grains doses.

Many workers on the treatment of malaria with the cinchona alkaloids recommend that this should be continued for many months, even six, while few recommend treatments lasting less than 3 weeks. The recent work on induced benign tertian malaria for the treatment of mental diseases has shown that the majority of such malarial infections can be cured by short courses of treatment of one week or less duration. The results recorded by Sinton and Bird (1929) show that in natural infections of this form of fever, mostly fresh, the relapse rate is less than 40 per cent. after courses of quinine or cinchona febrifuge lasting 4 to 7 days only, and is probably not much over 20 per cent. when alkaloids are used and treatment continued for one week. With chronic benign tertian infections given 10 days treatment (total 240 grains quinine) the relapse rate was

76.8 per cent., with 21 days treatment (total 560 grains quinine) it was 67.3 per cent., with 49 days treatment (total 770 grains) it was 60.0 per cent., and with 56 days treatment (total 840 grains) the rate was 55.6 per cent. Similarly the relapse rate with quinidine treatment fell from 86.2 per cent. with 14 days treatment (total 280 grains) through 82.8 per cent. at 21 days to 68.7 per cent. (total 560 grains) at 28 days. Acton (1920) also found that a four months continued course of quinine gave a cure rate about twice that of a two months course. There seems no doubt, therefore, that more prolonged courses of treatment with the cinchona alkaloids will give a higher cure rate than shorter ones, but the differences, especially in chronic infections are, in my opinion, too small to justify the very greatly increased expense of such treatment and the prolonged discomfort of the patient, when we have an adjuvant like plasmoquine with which such chronic benign infections can be more rapidly cured (*vide infra*).

With fresh infections of malignant tertian malaria the relapse rate due to this parasite was only about 20 per cent. after only one week of treatment with quinine and alkali (total 180 grains quinine), while in chronic infections receiving 210 grains quinine with alkali in one week the rate from *P. falciparum* was less than 10 per cent.

As pointed out previously little difference has been found in the rate of cure in fresh as compared with chronic infections of malignant tertian malaria, and while the majority of fresh infections of benign tertian malaria react quickly to the cinchona alkaloids, yet the chronic ones relapse in a large percentage of cases irrespective of the length of treatment. It seems probable as pointed out by James (1926) that there may be "some individuals very susceptible to malarial infection, and that some are relatively quite 'refractory' to infection. Intermediate between these two extremes are the great majority of people who may be described as normally susceptible." "The peculiar condition of susceptibility may be temporary" and James's results with benign tertian malaria led him "to the conclusion that the susceptibility to relapse is a susceptibility to malaria." If one accepts this conclusion it seems probable that while the majority of cases of malarial infection will be cured by comparatively short courses of the cinchona alkaloids, yet there are a few persons who are very susceptible to relapse and these constitute the chronic relapsing cases, which prove so difficult to cure with any form of cinchona treatment. The deduction to be made from this is that all fresh cases of malaria should be treated by short courses and those who prove to be of the chronic relapsing type should then be given special medication. These chronic infections are estimated by Wright (1922) to form about 10 per cent. of all



cases. The prolonged treatment which aimed at the production of a high percentage of cures in all cases irrespective of the form of infection, does not seem justified as a routine method either from the point of view of the patient or of the greater expense involved.

#### CONCLUSIONS REGARDING THE USE OF CINCHONA ALKALOIDS.

(1) Quinine and cinchona febrifuge are very suitable for the routine treatment of malaria and the choice of the alkaloid depends on the circumstances present.

(2) The preparation of the patient for treatment is an essential feature in the production of the best clinical and permanent results, while the use of daily doses of magnesium sulphate and of alkali are very important adjuvants to treatment.

(3) These alkaloids should be given orally in solution or, at least, in a very soluble form.

(4) The optimum daily dosage of quinine and cinchona febrifuge for an adult should be 30 grains for routine work and prolonged courses of treatment are not advised.

(5) The cinchona alkaloids have failed to be satisfactory in the cure of chronic benign tertian infections and in the destruction of the gametocytes of malignant tertian malaria, so it is necessary to employ some adjuvant to overcome these defects.

#### ARSENICAL PREPARATIONS.

Arsenic and its preparations have been used in the treatment of malaria for very many years. The famous Fowler's solution was originally used for this purpose under the name of "the tasteless ague drop" and since that time many other preparations of this drug have been extolled as of value in malaria.

In more recent years the newer organic compounds of arsenic, such as cacodylate of soda, atoxyl, salvarsan, etc., have at various times been said to have a destructive action on malarial parasites, but, as the result of experience the opinion of most workers is that these substances act largely by their tonic action on the body rather than by a marked parasitocidal effect. There is no doubt that some of these compounds have a direct action on *P. vivax* but seem to have little or no action on *P. falciparum*.

The discovery of "Stovarsol" (acetyl-oxy-amino-phenyl-arsenic acid) seemed to open up a new phase in the treatment of benign tertian malaria, for it was found that this drug had a marked destructive action on *P. vivax*. More recently two other closely allied compounds, troposan and parosan, have been prepared and combinations of the stovarsol group with quinine have also been placed on the market.

#### STOVAR SOL.

In our investigations this drug was only tested in chronic benign tertian malaria, as the

experience of other workers was that it had little value as a parasiticide in malignant tertian fever.

#### A. Effects of Stovarsol in the production of a cure in benign tertian malaria.

The same factors were used in estimating the effects of this drug in the production of a cure as were employed with the cinchona alkaloids. The drug was employed by the oral route both alone and in combination with quinine, while its sodium salt was used intravenously. Full details of these experiments have been given by Sinton (1926*d*), Sinton (1927), and Sinton, Bird and Eate (1928).

##### (1) The Production of a Clinical Cure.

###### (a) Effects on Fever.

Of 10 patients who received orally 1 gramme of stovarsol daily the average duration of fever was 0.85 days; of 37 cases who received at the same time in addition to this dose 30 grains of quinine in solution daily the duration was 0.78 days, while among 25 controls given quinine it was 0.70 days.

When the two drugs were given orally in combination in a daily dosage equivalent to 0.52-0.64 grammes stovarsol and 7-12 grains of quinine, the average duration of fever was 0.37 days in 23 cases as compared with 0.31 days among 108 controls treated with different cinchona alkaloids.

Twenty-five patients who received intravenous injections of about 1-1.5 grammes daily of sodium stovarsol on alternate days had an average duration of fever of 0.52 days as compared with 0.29 among 85 controls treated with the cinchona alkaloids at the same time.

In none of the total of the 95 patients given stovarsol in some form did fever last more than 3 days.

###### (b) Effects on the Persistence of Parasites in the peripheral blood.

Stovarsol was found to have a marked destructive action on both the asexual and the sexual forms of *P. vivax* and to cause a rapid disappearance of these parasites from the peripheral blood. This action seemed to affect all stages of the parasite. Among forty-seven patients who were given stovarsol, either alone or in combination with quinine orally, the average duration of the parasites was 1.52 days, while among 25 who received the drug intravenously the duration was only 0.04 days, as compared with 0.57 among the quinine controls.

###### (c) Effects on Splenic Enlargement.

The cases who received stovarsol only had a spleen rate of 57 per cent. before and 31 per cent. after treatment as compared with 37 and 9.2 per cent. among the controls.

Those receiving quinine-stovarsol had a rate of 39 per cent. before and 17.3 after treatment, and the controls showed 30.6 and 7.4 per cent. respectively.

## (d) Conclusions.

Stovarsol has a marked effect in producing a clinical cure in benign tertian malaria, and causing the disappearance of parasites from the peripheral blood. The effect on splenic enlargement does not seem to be so marked as that of the cinchona alkaloids.

## (2) Production of a Permanent Cure.

(a) Stovarsol. Ten patients were treated with this drug in doses of 1 gramme daily by the mouth for 3 days and they all relapsed. (b) Sodium Stovarsol by intravenous injection. One patient received 1 gramme of this drug only, while 10 were given two similar doses separated by an interval of one day, but they all relapsed. Fourteen cases were given three doses (1, 1½ and 1½ grammes) during 5 days and of these 86.7 per cent. relapsed, while one patient receiving four doses in 7 days did not. The average relapse rate among these 26 patients was 88.4 per cent. (c) Stovarsol and Quinine orally. The drug was given either as the compound quinine-stovarsol or in conjunction with quinine in solution. Thirty-seven patients were given two courses of 1 gramme of stovarsol daily with an interval of 4 days between them, while at the same time 30 grains of quinine was given daily for 2 weeks. The average relapse rate was 70.6 per cent. Twenty-three cases received the drug in doses corresponding to 0.53 to 0.64 grammes in combination with 8 to 12 grains quinine daily for 28 days and the average relapse rate was 70 per cent., being 80 per cent. in the small dose series and 60 with the larger dosage.

## (3) Other Actions of Stovarsol.

It was found that stovarsol had an effect in provoking a febrile reaction in cases of benign tertian malaria. This action is probably due to the destructive action of the drug on all stages of the parasite with a consequent liberation of a large amount of malarial protein into the blood. This action must be remembered in the administration of the drug, for, if given immediately before an expected paroxysm, one may get the combined effect of the segmentation of the parasites and the provocative action of the drug, so causing very high fever.

Several observers have recorded toxic symptoms of a great or lesser degree following the administration of this drug, but, except for slight jaundice in one case, no ill-effects were observed in our cases, even when a total of 4 grammes had been given by intravenous injection in 5 days. This absence of toxic manifestations was probably due to the routine administration of sugar to protect the liver and alkali to protect the kidneys, as well as to the magnesium sulphate purgation (Sinton, 1927; Sinton, Bird and Orr, 1928).

## TROPOSAN.

This drug was used in the form of quinine-troposan, which is the quinine salt of 2-oxy-5-acetylamino-phenyl arsenic acid and so is closely allied to quinine-stovarsol. The drug was administered orally with the same precautions against toxic manifestations as were used for stovarsol, and in no case were any such symptoms observed. All the cases treated suffered from chronic benign tertian malaria.

A. *Effects of Quinine-Troposan in the production of a cure.*

Two series of patients were treated, the first were given a daily dosage corresponding to 0.6 grammes troposan and 11.6 grains quinine for a period of 28 days. This dosage was well tolerated, so that in series two the daily dosage was increased to 0.9 grammes troposan and 17 grains quinine for 14 days and continued in a dosage similar to that in series one for another week. Full details are given by Sinton, Bird and Orr (1928).

## (1) Production of a Clinical Cure.

## (a) Effects on Fever.

The 20 patients who received the first treatment had an average duration of fever of 0.45 days, while among the 44 cases in series 2 it was 0.23, which was the same as that found among 68 quinine controls. Cases treated with plasmquine and plasmquine compound at the same time had average durations of 0.82 and 0.55 days respectively. No resistant cases were observed.

## (b) Effects on the Persistence of Parasites in the peripheral blood.

The average duration of parasites was 0.55 and 0.45 days respectively in the two series, as compared with 1.52 days when quinine and stovarsol were given. Patients treated with plasmquine and plasmquine compound at the same time had averages of 1.45 and 0.5 days respectively and with quinine 0.57 days.

## (c) Effects on Splenic Enlargement.

The splenic index in the troposan cases was 48 per cent. before and 19 per cent. at the end of treatment as compared with 55 and 20 with plasmquine, 50 and 20 with plasmquine compound and 59 and 9 among the quinine controls.

## (d) Other Effects.

The average gain in weight of patients treated with this drug was greater than among those receiving quinine, while the increase in the percentage of hæmoglobin was also slightly greater.

## (2) Production of a Permanent Cure.

Among twenty patients treated with the first dosage the average relapse rate was about 52 per cent., while among forty-four in the second series it was about 40 per cent. Both these

figures are distinctly better than the average of 70 per cent. of relapses recorded among chronic cases treated with the cinchona alkaloids, but are much higher than the results obtained among patients treated at the same time with plasmoquine or plasmoquine compound.

#### PAROSAN.

This drug was tried both as parosan oxide and as quinine-parosan. It seemed to be as effective as troposan but too few cases were tested from which to draw conclusive results (Sinton, 1930).

#### Conclusions regarding the use of Arsenical preparations.

(1) Stovarsol and troposan have a marked destructive action on all forms of *P. vivax* and will rapidly produce a clinical cure.

(2) The action of the drugs is better when combined with quinine.

(3) The relapse rate in cases of chronic benign tertian malaria was found to be smaller than with the cinchona alkaloids, when these arsenical preparations were given in combination with quinine.

(4) They seem to have a beneficial effect on the general condition of the patients.

(5) The precautions necessary to prevent toxic manifestation would seem to preclude their use as a routine measure and limit it to special cases.

#### PLASMOQUINE.

About the year 1925 the German chemists Schülemann, Schönöfer and Wiegler manufactured a new synthetic derivative of quinoline which they state to be a salt of alkyl-amino-6-methoxyquinoline with an analogous formula to quinine. The drug was found to have a marked destructive action on certain forms of the malaria parasite and it was believed by some workers that this compound would replace completely the cinchona alkaloids in the treatment of malaria. Unfortunately this has not been found to be the case, but, under certain circumstances, it forms a very useful adjuvant to such treatment and may prove a very important starting point from which to conduct further researches into synthetic drugs for the treatment of malaria.

The drug, originally called Beprochin and now known as Plasmoquine or Plasmochin, has undoubtedly a marked action on the parasites of benign tertian and quartan infections, but, while having a destructive action on the gametocytes of *P. falciparum*, it has little or no effect on the asexual forms of this parasite. A great drawback to the drug is the toxic effect which may follow its administration, and from which several instances of death have been reported. The literature on the action of the drug has been fully reviewed by Sinton and Bird (1928) and by Sinton, Smith and Pottinger (1930) to which articles workers are referred.

The remedy is issued by the makers as tablets in two forms, one as plasmoquine and the other as plasmoquine compound in which the drug has been combined with quinine.

#### EFFECTS OF PLASMOQUINE IN THE PRODUCTION OF CURE IN THE DIFFERENT FORMS OF MALARIAL FEVER.

##### (i) Production of a Clinical Cure.

As in the case of the cinchona alkaloids this has been gauged by the effects of treatment on fever, parasites and splenic enlargement.

##### (a) Effects on Fever.

The consensus of opinion now is that in the case of malignant tertian malaria plasmoquine by itself has little effect on the febrile manifestations of the disease, and that it should always be given in combination with quinine or at least one of the cinchona alkaloids, when this infection is present.

Table F summarises the results of the treatment of 183 cases of benign tertian malaria and from this it will be seen that while plasmoquine alone has a distinct action on the average duration of fever in this disease, yet, even when small doses are given, its action is enhanced if quinine is given at the same time. In only one case (PMC) did the fever last more than 3 days; this was probably due to the fact that the patient had severe diarrhoea and vomiting on the 2nd day of treatment, which necessitated a temporary cessation of the drug.

TABLE F.

Treatment.*	DAILY DOSAGE.		Total cases.	Average duration of fever. (Days.)
	Plasmoquine. (Grammes.)	Quinine. (Grains.)		
PM.	0.10—0.08	..	51	0.80
PMC.	0.10	20	35	0.30
PMQ1.	0.06	20	17	0.44
PMQ2.	0.04	20	48	0.35
PMQ3.	0.03	20	26	0.30
PM. inj.	0.03	10	6	0.75

\* PM. means plasmoquine alone; PMC., plasmoquine compound; PMQ., plasmoquine with quinine in solution; PM. inj., intramuscular injections of plasmoquine.

##### (b) Effects on the Persistence of Asexual Parasites in the peripheral blood.

When plasmoquine was given in doses of 0.08 grammes or more daily to six patients suffering from malignant tertian malaria, in three the parasites had disappeared at the end of 48 hours, but in two they persisted for 7 days, while in another they disappeared on the 3rd day but reappeared on the 12th. Five cases treated with plasmoquine compound (0.08—0.10 grms. daily) showed no parasites persisting after 48 hours when the daily doses of quinine

were 15 to 20 grains (Sinton and Bird, 1928). When the dose of plasmoquine was reduced to 0.04 grms. daily with 20 grains of quinine in solution, in 15 cases the average duration was 3.0 days, while with a dose of 0.03 grms. and 30 grains of quinine the average duration was 2.4 days in 11 cases. These results are in agreement with those of other workers, who have recorded that plasmoquine alone has little effect on the asexual forms of *P. falciparum*.

The parasitocidal action of plasmoquine on all forms of *P. vivax* has been confirmed by a large number of workers and Sinton, Smith and Pottinger (1930) have tabulated the results of treatment by plasmoquine, either alone or in combination with quinine, in 151 cases. From these figures it can be calculated that when plasmoquine alone was used in daily doses of 0.08 grms. the average persistence of parasites was 1.71 days; with plasmoquine compound (plasmoquine 0.10 grms. and quinine 20 grains daily) it was 0.47 days, while with plasmoquine (0.04–0.06 grms.) and quinine in solution (20 grains) it was 0.34 days. The more rapid action in the last cases with smaller doses of plasmoquine is possibly due to the fact that quinine in solution is better absorbed than quinine in tablet form, as given in plasmoquine compound. Since these results were published the persistence of parasites in 32 cases treated with 0.03 grms. plasmoquine and 20 grains of quinine in solution daily have been observed and the average persistence was 1.8 days. The control cases receiving 30 grains of quinine daily had an average duration of 0.57 days. These results suggest that during the acute stages of the disease the amount of cinchona alkaloid daily should be increased to 30 grains, if plasmoquine is reduced to daily doses of less than 0.04 grms. in order to prevent or obviate as far as possible the occurrence of toxic manifestations.

These figures go to show that while plasmoquine has a destructive action on *P. vivax*, its action is more rapid when quinine is given at the same time, and that the combination of the two drugs is probably more effective than either separately.

#### (c) Effects on Splenic Enlargement.

Several workers have recorded results which have led them to conclude that a very rapid decrease in the degree of splenic enlargement follows treatment with plasmoquine, but no evidence could be found in our results that this drug had any more marked action in causing a reduction of splenic enlargement than had the cinchona alkaloids.

#### (d) Conclusions regarding the Effects of Plasmoquine treatment on clinical cure.

There seems to be no evidence that plasmoquine alone has any more rapid action in the production of a clinical cure in benign tertian

malaria than have the cinchona alkaloids. The drug has little or no action on the clinical manifestations of malignant tertian malaria and should not be used in the treatment of this disease except in combination with some of the cinchona alkaloids.

#### (2) Production of a Permanent Cure.

Eight cases of malignant tertian malaria were treated with plasmoquine in doses of from 0.08 to 0.16 grammes daily, and of these 7 relapsed. Six cases were given short courses of plasmoquine compound and of these 3 relapsed with malignant tertian and 1 with benign tertian malaria. Only one of seven controls treated at the same time with quinine and alkali relapsed (Sinton and Bird, 1928). These results were to be expected from the effects on the clinical symptoms, and other workers have also recorded a high percentage of relapses in this infection.

The results of the treatment of 153 cases of chronic benign tertian malaria with plasmoquine alone and in combination with quinine have been recorded by Sinton, Smith and Pottinger (1930) and these results are tabulated in Table G.

TABLE G.

Treatment.*	DAILY DOSAGE × DAYS.		Total cases.	Average failure percentage.†
	Plasmo- quine. (Grammes.)	Quinine. (Grains.)		
PM(a)	0.08×17	....	29	36.0
PM(b)	0.08×28	....	22	22.7
PMC(a)	0.10×17	20×17	15	20.0
PMC(b)	0.10×28	20×28	20	3.4
PMQ(b)	0.06×4	20×21	17	0.0
	—0.06×21			
PMQ(b)	0.01×21	20×21	44	8.4
PMQ inj.	0.03×6	20×6	6	5.9
		20×7		

\*Treatments (a) are interrupted treatments and (b) continuous ones.

† Failure rates include those patients whose treatments had to be discontinued on account of severe toxic manifestations.

In a series of patients being treated at present with daily doses of 0.03 grms. plasmoquine and 20 grains of quinine in solution for 21 days, out of 21 patients who have completed the treatment only 1 has relapsed so far, while 6 others have completed their period of observation.

From Table G it will be seen that plasmoquine has a marked curative action in benign tertian fever and that the percentage of relapses is very much lower than the 70 per cent. recorded among similar cases treated with the cinchona alkaloids. The figures also show that a combination of this drug with quinine is

much better than either drug given alone. We have therefore a drug which, when given in combination with the cinchona alkaloids, will produce a high percentage of permanent cures among those most persistent relapsing infections, the chronic benign tertian ones. This marks a very distinct advance in the treatment of the malarial fevers.

The better results obtained with the PMQ treatment as compared with the PMC one may be due to the fact that in the former instance quinine was given in solution as compared with tablets in the latter. The results also suggest that the smallest effective dosage of plasmoquine for combination with quinine has not yet been determined.

### B. EFFECTS OF TREATMENT ON GAMETOCYTES.

Four crescent carriers were given 0.08 grms. plasmoquine daily and in one patient none of these forms were present after 24 hours, while in the others they persisted 1, 3 and 5 days respectively. In three patients treated with plasmoquine compound the maximum persistence of these forms was 48 hours. This destructive action of the drug on crescents has been noted by a large number of workers and has been confirmed so often that no doubt exists about it. As the cinchona alkaloids have little or no action on such forms, the discovery of plasmoquine is a distinct advance. Unfortunately plasmoquine has little effect on the asexual forms of *P. falciparum*, so patients treated with this drug only are liable to parasitic relapse during which there may be a reformation of crescents, if plasmoquine treatment has ceased. The action of the drug as a destroyer of gametocytes can only be a temporary one so long as the source of gametocytes, i.e., the asexual forms of an uncured infection, persists in the body.

The drug has a marked and rapid action on the gametocytes of *P. vivax* and the figures given above show this, as these results refer to both the sexual and asexual forms of this parasite. There does not, however, seem to be any evidence that its action is more rapid than those of the cinchona alkaloids in medicinal doses.

On account of the rapid destructive action of plasmoquine on the sexual forms of the three different malaria parasites, several workers have used it as a means of freeing human carriers from the forms of the parasite infectious to mosquitoes. Barber, Komp and Newman (1929), have found that a single small dose of plasmoquine equivalent to 0.015 grms. to an adult was sufficient to destroy for several days the viability of crescents taken up by mosquitoes, even although these forms themselves still persisted in the peripheral blood. This is a very important observation and if confirmed

should open up a new line of prevention, especially in areas where malignant tertian malaria is the predominant form.

### C. BEST METHOD OF ADMINISTRATION.

Although Sinton, Smith and Pottinger (1930) recorded good results from the intramuscular injection of plasmoquine in a few patients suffering from benign tertian malaria, this method of administration is not suitable for a standard treatment and does not seem to have any advantages over oral administration.

The original procedure recommended by the makers of this drug was a series of short oral courses interrupted by intervals of a few days, the total treatment taking a period of 28 days at least. In our work the "continuous" treatment seems to have a greater effect in producing a permanent cure than the "interrupted" one, although more liable to cause toxic symptoms when the large daily dosage of the drug is used. Continuous treatment with small daily doses, however, was found to be much less liable to cause toxic symptoms than interrupted treatment with larger doses.

### D. BEST DOSAGE AND DURATION OF TREATMENT.

The results tabulated in Table G show that the action of plasmoquine in chronic benign tertian malaria is much enhanced when the drug is combined with quinine.

The daily dosage of the drug originally recommended for adults was 0.10 grammes or even more, but this dosage has been found to cause in a number of patients unpleasant symptoms varying from such mild toxic effects as slight abdominal pains, mild cyanosis, etc., up to severe toxæmia characterized by intense cyanosis, severe vomiting and diarrhoea, collapse, methæmoglobinuria, albuminuria, coma, and even death. The literature on this subject has been summarised by Sinton and Bird (1928) and by Sinton, Smith and Pottinger (1930) and there is no doubt that with these large doses there is a real danger of poisoning, which makes the drug unsuitable for routine use in such amounts. The chances of toxic action seem to be reduced if the drug is given after meals and some workers advocate the administration of alkali and sugar as prophylactic and curative measures in relation to such manifestations.

On account of the low margin of safety present, a series of investigations, which are still in progress, were carried out to determine the best dosage and duration of treatment and also whether any dosage of the drug was suitable for general use outside hospitals, in view of the number of serious results and fatal accidents which have been recorded in different parts of the world. The adult dosage was reduced in a series of cases to 0.06 grms. daily and it was found that this amount when combined with

20 grains of quinine in solution daily, still gave a large percentage of cures in benign tertian malaria (Table G), but even with this dosage several patients developed severe toxic manifestations. A second series was given a daily dosage of 0.04 grms. with an amount of quinine similar to the former series. Among these patients the relapse rate was less than 10 per cent. but 25 per cent. of the cases still showed toxic symptoms, which were however mild in character.

From these findings it would appear that with healthy robust adults a daily dosage of 0.04 grms. of plasmoquine is the maximum dose which can safely be given and it is probable that even a smaller dose should be used in routine work. Investigations are being carried out with doses of 0.03 grms. daily combined with 20 grains of quinine in solution and the relapse rate has so far been very low in chronic benign tertian malaria. These results are highly favourable when compared with a rate of about 70 per cent. among similar cases treated with the cinchona alkaloids and it is suggested that, in view of the toxic symptoms which may accompany plasmoquine treatment, the daily dosage of the drug should be reduced to at most 0.03 grms., while the daily dosage of quinine be increased to 30 grains during the acute stage of the disease. Even although it is possible that these smaller doses of plasmoquine may produce a lower percentage of cures in chronic benign tertian malaria, the relapses would probably be cured by another course of treatment. In this way the dangers of toxæmia would be largely avoided and the increased dosage of quinine would probably increase the curative action. Irrespective of the dosage of plasmoquine used the administration of the drug should be ceased temporarily on the least suspicion of toxæmia.

#### CONCLUSIONS REGARDING THE USE OF PLASMOQUINE.

1. Plasmoquine alone is of little use in the treatment of the clinical manifestations of malignant tertian malaria.

2. The drug has a marked action in the production of both clinical and permanent cures in benign tertian malaria and its effects are enhanced by combination with quinine. Other workers have also reported good results in quartan malaria.

3. The rapid destructive and sterilizing effects of the drug on the gametocytes of all forms of the malaria parasite are a distinct advantage, more especially as the cinchona alkaloids have little or no effect on crescents.

4. The maximum daily dosage of the drug to robust adults should not exceed 0.04 grms. (about 2 1/3rd grain). It is probable that even this dosage is excessive for routine treatment in view of the low margin of safety.

5. Plasmoquine treatment should always be carried out under medical supervision and should be stopped on the least suspicion of toxic symptoms, which are usually first evidenced as abdominal pains or cyanosis.

6. The treatment should not be given, or only with extreme caution in hospitals, to persons suffering from lesions of the liver, kidneys or circulatory system. Great care should be exercised in the treatment of weakly and anæmic individuals.

7. In our present knowledge of the drug, the toxic manifestations make it unsuitable for routine treatment on a large scale in the doses originally recommended and limit its use in such doses to special cases, such as chronic benign tertian malaria treated under conditions where strict medical supervision can be exercised.

8. The drug forms a very important adjuvant to the cinchona alkaloids in malarial treatment and should always be given in combination with at least 20 grains of one of these drugs daily. When doses less than 0.04 grms. plasmoquine are given to adults daily, it seems advisable to increase the daily dosage of quinine to 30 grains during the acute stage of the disease.

9. Continuous treatment with small doses of the drug is preferable to interrupted treatment with large doses.

#### DISCUSSION OF RESULTS.

We are now in a position to consider how far the drugs studied have fulfilled the requirements laid down for an ideal treatment.

##### THE CINCHONA ALKALOIDS.

1. These drugs bring about a rapid cessation of the symptoms complained of by the patient in all three types of malarial fever.

2. They cause no harm to the patient in medicinal doses.

3. Although they produce a permanent cure in a high percentage of cases of all types of malaria, when properly administered, yet the cure rate in certain chronic cases is low.

4. They rapidly destroy the sexual forms of *P. vivax* and *P. malariae*, but have little effect on those of *P. falciparum*.

5. They are effective against all the forms of malarial fever in so far as clinical manifestations are concerned, but only produce a permanent cure in certain chronic cases of benign tertian malaria with great difficulty.

6. As compared with the other drugs they are cheap in price and require little medical supervision, but they are disagreeable to take and their action is not rapid enough in the production of a permanent cure in the majority of cases.

7. These alkaloids are still the mainstay of all forms of treatment of the malarial fevers, and their action can be reinforced by alkalies and magnesium sulphate.



## THE ARSENICAL PREPARATIONS.

1. Their action on symptoms is rapid in benign tertian malaria and possibly also in quartan, but not in malignant tertian fever.

2. Toxic effects may occur during treatment.

3. Their action in malignant tertian malaria is slight, while in benign tertian and quartan when given alone they have not proved better than the cinchona alkaloids in the production of a permanent cure.

4. They rapidly destroy the sexual forms of *P. vivax* and probably of *P. malariae*, but not of *P. falciparum*.

5. They are not effective against malignant tertian malaria.

6. They have little taste but are not cheap in price, require greater expert medical supervision and are not quicker in action than the cinchona alkaloids.

7. They are of use in special conditions and should always be used in combination with the cinchona alkaloids.

## PLASMOQUINE.

1. Given alone it has not so rapid an action as the cinchona alkaloids and has little effect on the symptoms of malignant tertian malaria.

2. It may cause serious harm to the patient.

3. It will produce a high cure rate in benign tertian and quartan malaria, especially when combined with quinine, but has little or no action in malignant tertian malaria.

4. It rapidly destroys or makes non-viable the sexual forms of the three species of malaria parasite.

5. It is not effective against the asexual forms of *P. falciparum*.

6. It has little taste but may be followed by disagreeable effects; it requires more medical supervision than do the cinchona alkaloids; it is more expensive and will not produce a permanent cure rapidly in many cases.

7. It forms a very important adjuvant to treatment with the cinchona alkaloids, more especially in chronic benign tertian malaria.

It is clear from the discussion that none of these drugs fulfils all the conditions of an ideal treatment, but it seems that by combining the properties of the cinchona alkaloids with those of plasmoquine, a marked advance would be made towards such an ideal although it would fail in its rapidity of action for the production of a permanent cure.

## SUGGESTED ROUTINE TREATMENT.

The treatment proposed below is designed for adult males and would require certain modifications with due regard to weight, age, etc., in the case of women and children.

When the disease has been diagnosed, in all cases the treatment should commence with a dose of 3 grains of calomel followed by one

ounce of magnesium sulphate dissolved in an equal amount of warm water.\*

Two mixtures are used in the routine treatment:—

## Mist. A. (Alkaline Mixture).

Sodium bicarbonate ..	grains 60 (4 grms.)
Sodium citrate ..	grains 40 (2.6 grms.)
Calcium carbonate (or chloride) .. ..	grains 3 (0.2 grms.)
Water to .. ..	ounce 1 (28.5 c.cs.)

Note.—The mixture to be well shaken before administration, as it is a suspension not a solution.

## Mist. Q. (Cinchona Mixture).

Quinine sulphate (or cinchona febrifuge) ..	grains 10 (0.65 grms.)
Citric acid .. ..	grains 30 (2 grms.)
Magnesium sulphate ..	grains 60 (4 grms.)
Water to .. ..	ounce 1 (28.5 c.cs.)

Notes.—Any flavouring matter desired may be added. If cinchona febrifuge is used, a nicer mixture is obtained if the solution is strained through lint. With European patients the magnesium sulphate can sometimes be reduced to 30 or 40 grains in each dose.

## Treatment I.

After the preliminary purge has acted, one ounce of Mist. A. is given, is repeated after an interval of one hour and again repeated after one hour. About  $\frac{1}{2}$  hour after the third dose of Mist. A., one ounce of Mist. Q. is given, and one ounce of Mist. A. is given  $\frac{1}{2}$  hour before every subsequent dose of Mist. Q.

Mist. Q. is given thrice daily for one week, preceded on each occasion by a dose of Mist. A. as directed. This means that the patient receives 5 doses of Mist. A. on the first day and three on each subsequent day, while one dose of Mist. Q. is given thrice daily, making a total of 210 grains of alkaloid in the week of treatment. In addition to this the patient should receive  $\frac{1}{4}$  grain (0.015 grms.) of plasmoquine once daily after food during the week he is on cinchona alkaloid treatment.†

This completes the specific course of treatment, but in debilitated or anæmic patients an after-treatment with tonics may be given, in which case stovarsol is sometimes useful.

This treatment combines the adjuvant action of alkali, magnesium sulphate and plasmoquine with the basic effects of the cinchona alkaloids. From the results recorded above, if the treatment is strictly adhered to, it should have a

\* In some severe cases it may be advisable to start specific treatment immediately, without waiting for these purgatives to act.

† It may not be practicable, in some instances, to continue the alkali in after-treatment to patients outside hospital, but it is an essential feature of the first 3 or 4 days of the acute attack. Even if alkali has to be omitted in the after-treatment, the magnesium sulphate should not be omitted from the quinine mixture.

rapid action on the clinical manifestations of all three kinds of fever, it should destroy or make non-viable the sexual forms of all three species of parasite, it should permanently cure at least 80 per cent. of all malignant tertian infections and probably more than 70 per cent. of fresh infections of benign tertian, as well as 20 or more per cent. of the chronic ones.

Relapses after this treatment should only be found among a very few malignant tertian cases and about 20 to 30 per cent., if so many, of benign tertian ones. If a relapse occurs Treatment II should be carried out.

#### *Treatment II (Relapsing Infections).*

If the relapse is due to malignant tertian malaria. Treatment I should be repeated for one week and the quinine and alkali treatment continued in similar doses but only twice daily for another week with no plasmoquine. If the relapse is due to benign tertian malaria or a mixed infection, Treatment I should be repeated as for relapses in malignant tertian malaria, but the daily dosage of plasmoquine may be raised to 1/3rd grain (0.02 grms.) during the 14-day course of treatment.

If a relapse occurs after this treatment due to malignant tertian malaria, Treatment II is repeated, if due to benign tertian or quartan give Treatment III.

#### *Treatment III (Chronic Relapsing Infections).*

The cinchona alkaloid dosage described in Treatment I is given for one week combined with a total daily dosage of 1/2 to 2/3 grain (0.03-0.04 grms.) of plasmoquine administered in two divided doses after meals. During the next two weeks Mist. Q. is given twice daily with a similar dosage of plasmoquine continued during this period. Subsequent relapses are treated by a repetition of this treatment. This treatment should be carried out under very strict medical supervision and all precautions taken with respect to toxic manifestations.

As far as can be judged from the results of our work it is estimated that Treatment I should cure roughly 80 per cent. of all the ordinary types of infection seen in general practice, irrespective of the parasite involved. Treatment II should cure another 10 per cent. of the total or at least half the remainder, leaving about 9 per cent. of chronic benign tertians or quartans and about 1 per cent. of malignant tertians, of which practically all the latter should be cured by the repeated treatment. Treatment III is designed to cure the remaining chronic benign tertian and quartan infections. If this treatment is strictly carried out not more than 1 per cent. of the original cases should remain infected and these should be cured by another course.

#### GENERAL MANAGEMENT OF PATIENTS.

The patients should be confined to bed during the acute stage of the disease. During the cold

stage of the paroxysm copious hot drinks are appreciated, while at all stages plentiful alkaline drinks, such as lemon-squash and similar beverages, are both comforting and beneficial to the patient. Such drinks help to dilute the "toxins" and also reinforce the alkaline treatment.

The patient should not be starved, as starvation helps to increase the acidosis. Fats should be avoided at all stages of the treatment and meat diet given only sparingly during the acute manifestations. Abundant vegetables and fruit, such as oranges, tomatoes, apples and pine-apples, should be given as these tend to raise the alkali reserve. Abundant carbohydrates can be given and plenty of sugar tends to protect the liver and stimulate the circulation. An iron and arsenic tonic after the termination of specific treatment may be useful in anæmic and debilitated patients, while a liver diet may be helpful in combating the anæmia. The night blindness complained of by some chronic malarial patients is probably dependent upon anæmia and here again liver diet is useful.

My thanks are due to the Governing Body of the Indian Research Fund Association who provided funds for this enquiry; to the Director of Medical Services in India and to the Inspector-General of Jails, Punjab, for the facilities placed at our disposal; and to the numerous officers and the staff who have collaborated with me and assisted in these investigations.

#### *Appendix A.*

The composition of cinchona febrifuge varies very much in different samples. This variability has been discussed at length in an article sent for publication to the *Records of the Malaria Survey of India*, in which a large number of the recorded analysis of this substance are reproduced.

The cinchona febrifuge used in the experiments on the Indian patients was understood to have the following composition—

	Per cent.
Quinine .. ..	8-10
Quinidine .. ..	2-3
Cinchonidine .. ..	25
Cinchonine .. ..	25
Amorphous alkaloids .. ..	30-45

"Malarene," a purified and standardised preparation of the total alkaloids, was used in the British cases. This drug was prepared by the Government Cinchona Factory of Madras, and I am indebted to A. Wilson, M.A., B.Sc., Deputy Director of Agriculture (Cinchona), for the formula of this preparation given below:—

	Per cent.
Quinine .. ..	8
Cinchonidine .. ..	22
Cinchonine .. ..	18
Quinidine .. ..	5
Amorphous alkaloid .. ..	30
Moisture .. ..	5-10

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## FACTORS WHICH DETERMINE THE DIFFERENCES IN THE TYPES OF LESIONS PRODUCED BY *FILARIA BANCROFTI* IN INDIA.

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A REFERENCE to the literature on filariasis brings out the remarkable fact of the numerous variations in the manifestations of the infection in different endemic areas. Whereas in a given area all the types of filarial diseases may be seen, there is one particular type of obstruction that is very common for that area, whilst other types may be comparatively rare. Bahr (1912), O'Connor (1923) and Buxton (1928) found elephantiasis to be the most common type of filarial manifestation in the Pacific

Islands. The Filariasis Commission of the London School of Tropical Medicine (1924) record that in more than 92 per cent. of the patients examined the lower limbs were involved, whereas chyluria was found in only 1.9 per cent. of the cases. Le Chutton (1923) found lymphatic varicocele to be the most common form of obstruction in Saigon, whereas elephantiasis was rare. Our own observations in India show that while in Cochin elephantiasis is the commonest clinical lesion, in Allahabad lymph-varix and chyluria predominate. It may perhaps be relevant here to mention that certain pathological states, such as dermatolysis and Cushing's type of hypopituitarism, etc., on account of their superficial resemblance to elephantiasis have been mistaken for filarial disease. These lesions will not be considered here, but will be dealt with separately.

The data that have come into our possession from the cases which we have studied during the last nine years at the Calcutta School of Tropical Medicine have given us abundant material to carry out a detailed examination of the different manifestations, and to work out an association between these types of lesions and the local conditions of climate, environment, etc. The laboratory and hospital work have in all cases been supplemented by a personal study in the field by one of us (S. S. R.) and the observations given are the results of a careful and detailed investigation on the subject.

Six typical areas (Map 1) were investigated from this point of view, and are discussed in this paper.

### Physiography and Environment.

Cochin is situated in a low flat country on the west coast of South India and is separated from the mainland by a large backwater arm. The soil is mostly sandy. The place has a heavy annual rainfall of 115 inches, and a uniform warm temperature with very little diurnal variation. The humidity is very high, the normal annual mean humidity at 8 hours being 81 per cent. In this town *Culex fatigans* is very common and there are innumerable breeding places everywhere—pits, drains, and reservoirs in which cocoanuts are steeped to obtain the fibre. The *Culex* breeding is intense and goes on all the year round. A cosmopolitan population of Hindus, Christians, Mahomedans and Jews live in the town and are mostly engaged in agriculture and cocoanut produce.

The town depends for its water supply on ponds and shallow wells, which also form breeding grounds for the *Culex* mosquito. There is no regular system of drainage, and conservancy arrangements are very unsatisfactory.

Puri is a town situated on the east coast. The town has an annual rainfall of 60 inches, and has a uniformly humid temperature all the

year round. The average annual humidity is 83 per cent. *Culex fatigans* is very common, and there are a very large number of breeding places throughout the town, in sump-pits, and open sewers, so that breeding goes on right through the year except during the heavy rains. Being a centre of pilgrimage, it has a large floating population.

Cuttack is between two large rivers, the Mahanadi and the Katjuri, at the head of the Mahanadi delta and fifty miles from the sea. The climatic conditions are very similar to those observed at Puri. Being the divisional headquarters and a commercial centre of some importance (the largest town in Orissa) it is thickly populated and urban conditions of life prevail but without sanitary amenities. Parts of the town are at a low level and get flooded

high. It is a cosmopolitan city with all modern sanitary devices. In the vicinity of the city proper are seen numerous ponds, mills and rice factories forming a very fertile ground for *Culex* breeding, particularly during the winter months.

The conditions with regard to the climate at *Purulia* are about the same as those found in Calcutta, but the former place shares with Cuttack and Puri the system of open drainage, the effect of which combined with sullage-pits which are never properly emptied form excellent breeding grounds for *Culex fatigans*.

Allahabad, which is situated far inland at the junction of the Ganges and Jumna, has the lowest annual rainfall of the places described here, i.e., about 30 inches. The climatic conditions are very variable. There is a cold weather season and a very hot summer. The humidity



Map 1.—Showing the areas discussed in the paper.

during the monsoon season. The insistence of the municipality on maintaining sump-pits for pucca houses affords a fertile field for *Culex* breeding, especially as the arrangements to empty the pits are very inadequate. The chief occupation is agriculture, although a fairly large section of the population is engaged in the horn industry.

Calcutta has a fairly heavy rainfall of 65 inches during the year and the temperature is not uniform. During some months there is a considerable diurnal variation in temperature. The normal annual mean humidity at 8 o'clock in the morning is 83 per cent. The *Culex fatigans* season starts in September, and goes on till March during which period the incidence of these mosquitoes is very

is also low, being 66 per cent. *Culex fatigans* is fairly common and breeds in sullage-pits and in drains of the town. The breeding season of these mosquitoes is restricted to the few months following the rainy season.

#### *Microfilaria rates, Table I.*

This was worked out for each of these towns in the following manner. In Cochin, Puri and Purulia, the statistics were collected from the jails, the hospitals and the general public. In Cuttack one of us (S. S. R.) spent several months during this investigation collecting statistics from the public, jails, educational institutions, hospitals and asylums. The figures for Calcutta have been mostly obtained from data accumulated at the Filarial Clinic of the

School of Tropical Medicine and from the Carmichael Hospital for Tropical Diseases. These have been supplemented by examination of children, boys and girls, as well as adults

to 80°F.) causes the embryo to develop much more slowly, i.e., in about 20 days. How the above facts are intimately connected with the transmission of the parasite is discussed in two

TABLE I.  
*Microfilaria rates.*

Place.	Total number examined.	Number showing microfilariae in blood.	Microfilaria rates. Per cent.
Cochin	298	60	20.13
Do. (Cruickshank and Wright, 1913-14) (a)	1,000	209	20.9
Puri	200	43	21.5
Do. (Roy and Basu, 1922) (b)	411	120	29
Cuttack	492	125	25.4
Do. (Calvert, 1903) (c)	200	52	26
Calcutta	762	73	9.6
Do. (Green, 1902) (d)	100	7	7
Purulia	340	44	12.9
Allahabad	264	18	7
Do. (Dr. D. Forman, 1929) (e)	2,180	207	9.5

(a) *Indian Journ. Med. Res.*, Vol. I, 1913-14, p. 741.

(b) *Indian Med. Gaz.*, Vol. LVII, 1922, p. 281.

(c) *Ibid.*, Vol. XXXVIII, 1903, p. 180.

(d) *Ibid.*, Vol. XXXVII, 1902, p. 91.

(e) Personal communication.

from the various institutions and the general public. At Allahabad, besides the figures collected by us, we had valuable data supplied to us by Dr. D. N. Forman. The statistics are fairly representative of the populations under investigation.

A study of these blood films made from various persons in the jails, hospitals, schools, general public, and supplemented by cases who have come under our observation at the School has enabled us to obtain the microfilaria rate. The table summarising these results (Table I) shows that three broad groups can be made out. Places where the population shows a microfilaria rate of 20 per cent. and over may be classified as hyperendemic areas. The moderate endemic areas come next, where a microfilaria rate of 10 to 20 per cent. is present in the population. Towns showing a microfilaria rate under 10 per cent. can be considered to be places of low endemicity.

#### *Effective period of infection.*

Experiments have been carried out by Sundar Rao and Iyengar (1930) in the laboratories of the School regarding the optimum conditions of temperature and humidity in relation to the transmission of this helminth. Briefly stated, the results obtained show that a relative humidity of 60 per cent. and over and a temperature range of 80° to 90°F. are the optimum conditions necessary for the development of this parasite in its insect host. Under these conditions, the metamorphosis of the embryo takes place in 10 days. A drier climate (humidity 30—50 per cent., and a temperature from 60°

papers by Sundar Rao and Iyengar (1930 and 1930a).

From Table II it is clearly seen that these optimum conditions are obtained for relatively longer or shorter periods in the various localities concerned. Thus, for instance, the effective period for transmission during the year is in Cochin about 8 months, in Puri about 7 months, in Cuttack 6 months, in Calcutta 7 months, in Purulia 5 months, and in Allahabad 4 months.

In hyperendemic areas where the effective period of infection is from 6 to 8 months as shown above, the microfilaria rate is usually above 20 per cent. Lesions of the type of hydrocele, chylocele and chyluria are not often observed, but on the other hand elephantoid conditions of the limbs and breasts predominate.

In the moderately endemic areas, the effective period of infection may be taken as 4 to 5 months, and the common types of lesion observed are a moderate degree of elephantiasis of the limbs and hydrocele, chyluria, chylocele, etc.

In the slightly endemic area where infections can only take place for a few months chyluria, chylocele and lymph-varix are the commonest lesions seen, and elephantiasis of the limbs is very rare.

*The mosquito factor.*—Recent work in Calcutta (Rao and Iyengar, 1930) confirms the observations of Cruickshank and Wright (1913-14) that *Culex fatigans* is the transmitter of filarial infection in India.

A consideration of the habits of this mosquito in relation to the conditions of temperature and environment is of the utmost importance in understanding the incidence of infection.

TABLE II.

Showing the probable period of infection in months. The months when transmission is occurring are shown in heavy type.

## MONTHLY NORMALS OF WET-BULB TEMPERATURE.

	Cochin.	Puri.	Cuttack.	Calcutta.	Purulia.	Allahabad.
January .. .. .	69.3	63.7	59.9	57.1	53.3	50.3
February .. .. .	72.4	68.9	61.9	61.7	56.3	53.8
March .. .. .	76.3	74.9	71.7	70.3	62.2	60.0
April .. .. .	77.7	79.3	76.8	76.7	69.6	66.5
May .. .. .	77.8	78.3	79.3	79.0	75.0	72.9
June .. .. .	75.9	80.8	79.0	79.8	77.4	78.3
July .. .. .	75.0	80.3	78.2	79.4	77.7	79.4
August .. .. .	74.9	79.6	78.1	79.3	77.4	78.9
September .. .. .	75.4	79.2	77.9	79.0	76.9	77.6
October .. .. .	75.6	76.8	74.5	76.0	71.4	69.3
November .. .. .	74.6	68.6	66.1	66.6	61.0	59.3
December .. .. .	70.9	61.7	58.9	57.4	53.1	50.9
Probable period of infection in months.	S	7	6	7	5	4

It is necessary that the optimum climatic conditions of temperature and humidity necessary for the development of the embryos to be effective for transmission must coincide with the breeding season of the mosquito. Thus if local conditions favour the breeding of the mosquito during the winter months, as pointed out previously for Calcutta, the optimum conditions would not be favourable for the transmission of the parasite, so that although the temperature and humidity may appear to be favourable during the monsoon there would be few *Culex* to transmit the disease, and the chances of infection would be small.

Reviewing the results of our observations in the different localities in view of the facts mentioned above, we arrive at a conclusion explaining these differences in statistics which would at first sight appear to be anomalous. Thus *Cochin* has in addition to the long optimum period of temperature and humidity a correspondingly long period favourable for *Culex* breeding. The stagnant pools are replenished right throughout the year, and as the coir industry depends on the decay of organic material it offers a permanent site for prolific *Culex* breeding. In these places we expect the chance of infection to be very heavy, as the microfilarial rate of over 20 per cent. proves.

*Puri* is a place of pilgrimage and this factor plays a large part, in addition to the naturally existing environmental conditions for *Culex* breeding such as numerous stagnant drains and sullage-pits. The optimum period of infection and *Culex* breeding also closely coincide, but the large floating population of this town must carry away with them the bulk of the infective filaria larvæ, so that the microfilarial rate is only 20 per cent. in spite of favourable conditions.

The conditions at *Cuttack* are almost identical, except that there is a fixed population. One interesting fact brought to light during the course of our detailed work may be mentioned here. In *Cuttack* (*vide* Map 2) infection is very heavy in the most crowded parts of the town, whereas in the outskirts with a scattered population the corresponding figures are much less. In the crowded parts of the city we have a combination of a larger number of human filarial carriers and a heavy incidence of *Culex fatigans* as shown by the innumerable breeding places of this species. The chances of transmission from one human being to another are greatly increased by the density of the population in these areas. During the course of this survey we found a very high incidence of filaria infection in the *Culex* mosquitoes in the crowded parts of the city. One of us (S. S. R.) was spending the evening with the Civil Surgeon of the town (who was living on the outskirts of the town) and during the course of conversation offered to demonstrate that almost every *Culex* mosquito caught in the compound would harbour filaria. Although these mosquitoes were very numerous yet none of them showed any filaria. Later investigations showed the reason of this anomaly; the high infective rate is associated with three conditions, density of population, number of *Culex*, and optimum conditions during the breeding season.

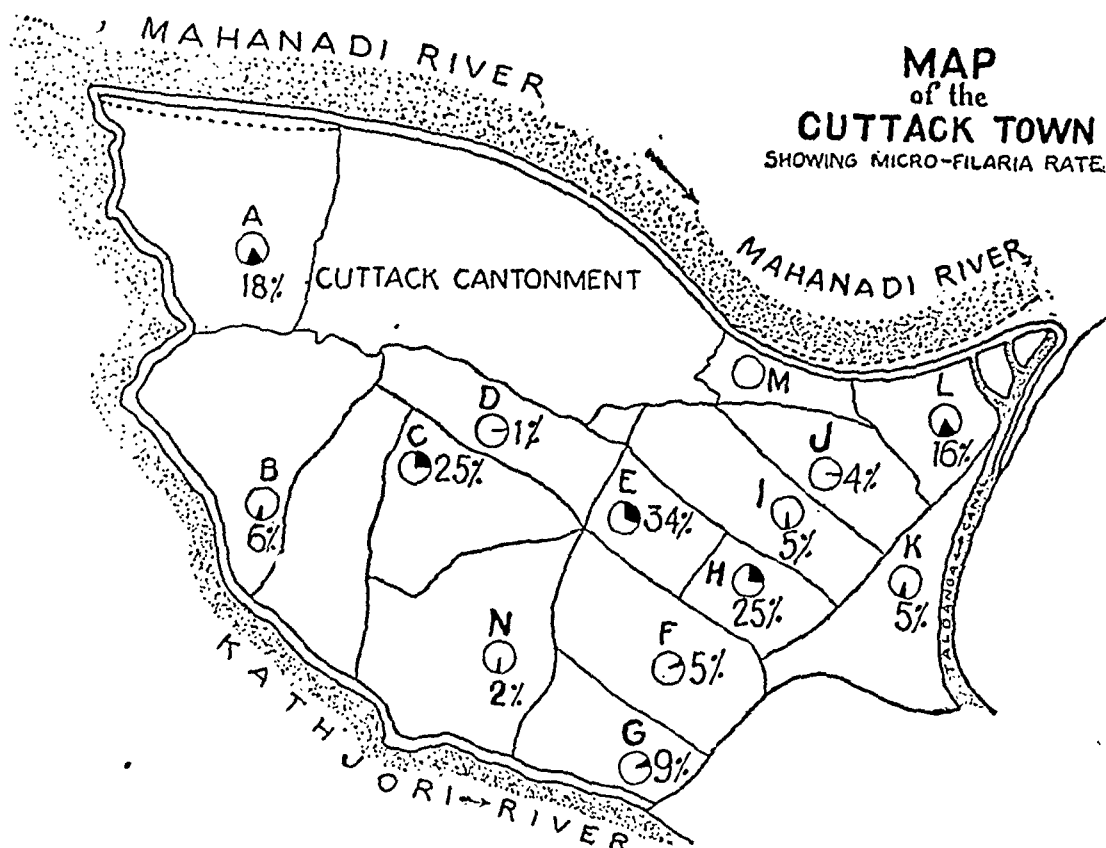
*Calcutta*.—The optimum period for Calcutta is about 7 months (*viz.*, April to October) but it is significant that the microfilaria rate is comparatively low (9.6 per cent.). These figures would probably be still lower if it were not for the fact that a certain number of imported cases come to Calcutta for treatment and are included in our statistics. The reason for this low percentage is now quite apparent



A satisfactory drainage system and good sanitary conditions reduce the number of *Culex* breeding places in the city. During the monsoon months owing to the heavy rainfall few permanent breeding places are found, but when the winter sets in the breeding places are more numerous, and with the decay of organic matter and other suitable conditions there is an enormous increase in the *Culex* population of the city. This is precisely the period which is least favourable for the development of the filarial embryos in the mosquito. It follows

conditions are present in the town and village, but the absence of crowding in the village and of suitable breeding places affects the statistics remarkably. The case of the town is similar to that described for Cuttack.

*Allahabad.*—We see from Table II that the optimum period of temperature and humidity is only four months (June to September). This sharp seasonal difference acts adversely on the *Culex* population and only favours their breeding after the rains. Adult mosquitoes for effective transmission are only present for  $1\frac{1}{2}$  to 2



Map 2.—Map of Cuttack Town showing the micro-filaria rate in the different areas of the town surveyed.

that in Calcutta the favourable period for transmission does not synchronise with the breeding of the *Culex* as is seen in other localities, so that we have these two periods coming at different dates and in consequence the micro-filaria rate is low.

*Purulia.*—The sanitary conditions in Purulia are very much like those in Cuttack or Puri, the seasons of mosquito breeding synchronise with the optimum period of infection (May to September). The micro-filaria rate is about 13 per cent. Considering the shortness of the duration of the period of favourable transmission, the figures are in accordance with our general observations. We have here to mention an interesting fact (see Map 3) that while a portion of the crowded town of Purulia (marked with a circle) showed a micro-filarial rate of 7.5 per cent., a village (Osmanpur) five miles to the west of the town with a population of 97 living in a group of 20 houses showed no micro-filaria in their blood. Identical climatic

months during the optimum period, yet the micro-filaria rate for this town is therefore comparatively high, i.e., about 7 per cent., no doubt partly due to the density of population, and the number of breeding places.

#### *Clinical manifestations of filarial infection.*

The clinical manifestations of filariasis are well known. *Filaria bancrofti* is a parasite living in the lymphatics, and for any intelligent understanding of the manner in which the different types of filarial diseases are caused a thorough grasp of the anatomy of the lymphatic system is necessary.

Briefly, the peripheral lymphatics of the lower limbs drain into the inguinal glands which empty into the iliacs, external and internal, thence to the common iliac glands and finally through the aortic glands to the thoracic duct (Text-fig. 1). In the upper limb, the lymphatic glands of importance are the epitrochlear at the elbow and the axillary group. The



PLATE I.

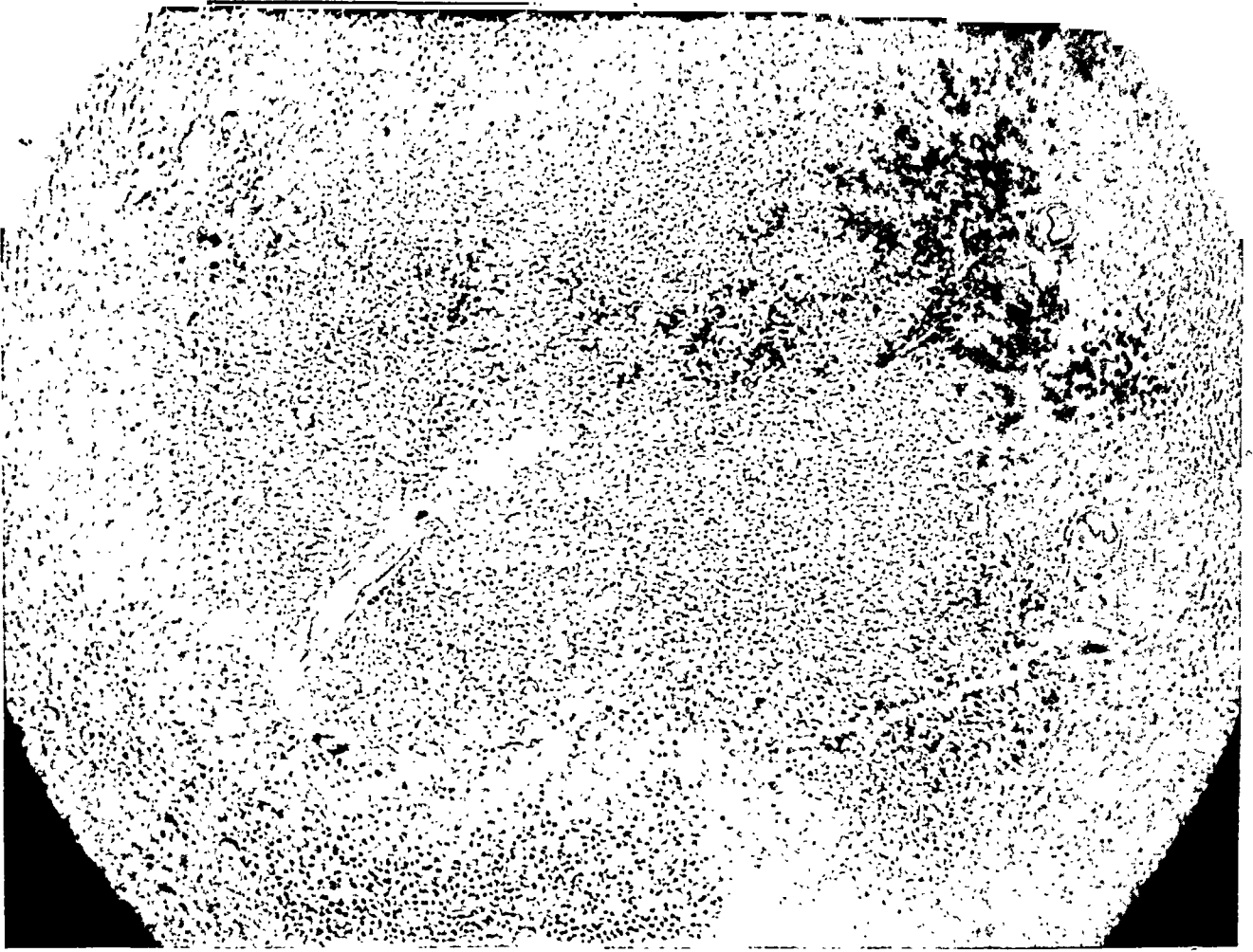


Fig. 1.—Micro-photograph of section of lymphatic gland showing the granulomatous changes as a result of filarial infection. Note the transverse and longitudinal sections of immature filariæ.

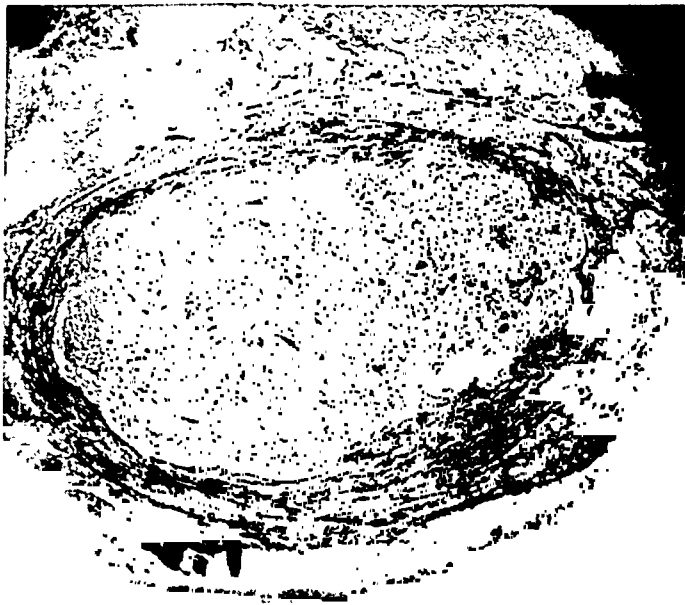


Fig. 2.—Micro-photograph of section of lymphatic gland, a mass of fibrous tissue.

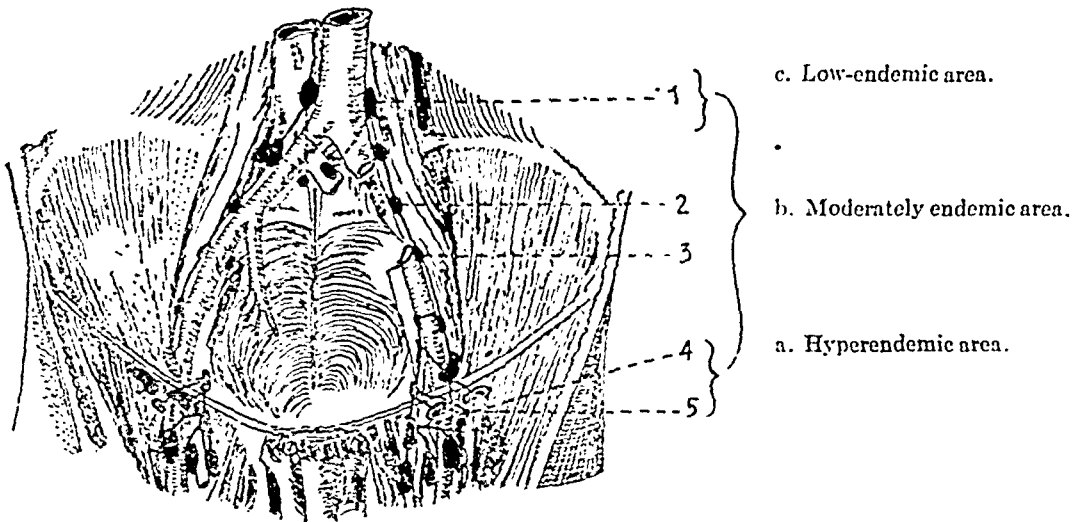
lymphatic glands from the breast drain into the axillary group.

As the *Culex* mosquito bites chiefly on the legs, the immature filarial larvæ get into the lymphatic vessels and work their way up to the inguinal glands. In hyperendemic areas where very intense infection results a large number of immature filariæ enter the system, and the pathological changes accompanying this process are characteristic. The large number of immature filariæ set up irritation in the lymphatics and glands low down (Text-fig. 1, a); obstruction of the external superficial inguinal glands in the case of the lower limbs, and the epitrochlears in the case of the arms, results. In the former instance continued infection affects the deep inguinals, and in the

of the inguinal glands they were seen to have enlarged in size, and from them a number of adult filariæ were isolated in each case.

It is shown (p. 626) in this paper that in hyperendemic areas the age incidence of the microfilaria rate and the age of onset of filarial lesions is early (5 to 10 years). It may occasionally happen even in these towns that at an early age some of the immature filariæ may find their way to the aortic glands and cause hydrocele or chyluria.

In a moderately endemic area the intensity of infection is only moderate, and the migration of the embryos into the lymphatics is not so heavy as in hyperendemic areas. The irritation and blockage of the low lymphatic glands



Text-fig. 1.—Scheme of ilio-pelvic glands.

1. Lateral-aortic group. 2. Common iliac group.
3. External iliac group. 4. Deep inguinal group.
5. Superficial inguinal group.

(After Cunéo and Marcille.)

latter the axillary glands. These give rise to the elephantoid conditions of limbs and breast.

A very intense infection sets up an early blockage, as a consequence of which the immature larvæ entering subsequently are not able to pass upwards; aberrant migration takes place giving rise to fugitive swellings and abscess formations.

The pathological changes which take place in the gland may be briefly outlined here. The whole gland becomes increased in size; there is marked periadenitis and in the course of a short time the gland is converted into a mass of granulation tissue (Plate I, fig. 1). Later there is no longer any lymphoid tissue in the gland, and it becomes a shrunken fibrous mass (Plate I, fig. 2). Adult filariæ may often be met with in the dilated lymphatics near the hilum. We saw two instances of enlarged inguinal and epitrochlear glands in patients coming from hyperendemic areas, in whom no microfilaria were found in the blood; on removal

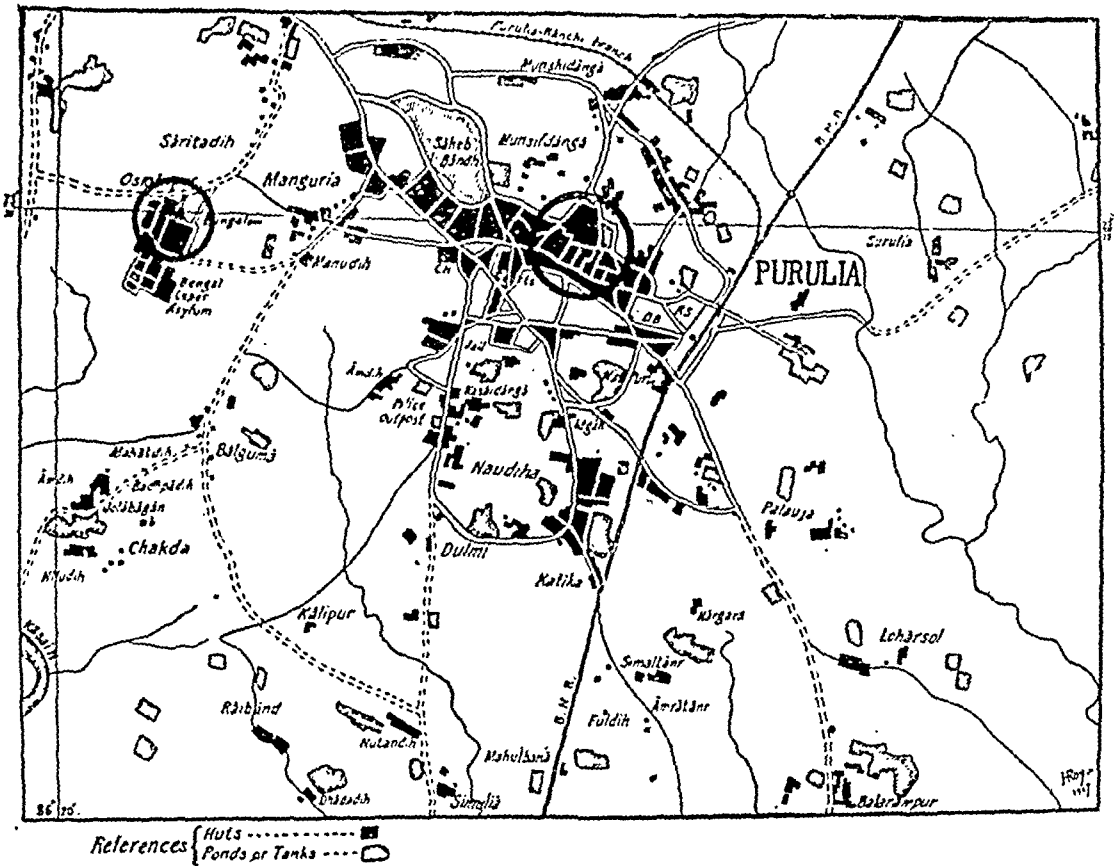
are comparatively rare. The blockage first occurs near the juxta-aortics (Text-fig. 1, b); consequently hydrocele is the earliest manifestation of the infection. Continued infection and irritation results in the obstruction of the lower set of glands. Under these circumstances elephantiasis of the scrotum, unilateral or bilateral œdema of the legs and less frequently of the arms are the lesions commonly seen in these towns.

The changes taking place in the glands here are somewhat different from those observed in hyperendemic areas. The enlargement is slight, and in contrast to the hard gland met with in hyperendemic areas the gland is slightly tender. The other pathological changes in the gland are similar to those described above except that the amount of damage to the gland tissue is less. The age incidence in a moderately endemic area is somewhat higher (10 to 15 years) than in the hyperendemic area. In younger persons hydrocele and chyluria are more commonly

seen, but older persons show elephantoid conditions of the genitals and limbs.

In areas of low endemicity, owing to the smaller number of filarial embryos transmitted,

commonest types of lesions met with in such areas. Obstruction to the iliac and inguinal glands is comparatively rare, so that elephantiasis of the scrotum and limbs is not often



Map 3.—Filariasis survey—

	Number examined.	Number positive.
Portion of Purulia town ..	201	15
Osmanpur village ..	97	Nil.
Areas surveyed are shown in black circles.		

these easily work their way up the lymphatics of the limbs, without causing sufficient damage to these to cause obstruction, so that blockage almost invariably occurs high up in the region of aortic glands (Text-fig. 1, c). Hydrocele, chyluria and lymph-varix are the

seen. The pathological changes in the glands are slight compared with the destruction observed in the case of hyperendemic areas. The age incidence here is much later (18 to 25 years) and even in grown-up persons elephantoid conditions are not common.

TABLE III.  
Age incidence of filarial infection.

Age period.		Cochin.	Cuttack.	Calcutta.	Allahabad.
1—5	Total examined ..	2	14	48	5
	Number with microfilaria.	0	0	0	0
	Percentage ..	0	0	0	0
6—10	Total examined ..	5	32	27	16
	Number with microfilaria.	1	1	0	0
	Percentage ..	..	..	0	0
11—15	Total examined ..	12	57	313	38
	Number with microfilaria.	2	5	12	0
	Percentage ..	..	..	4	0
16—20	Total examined ..	31	136	475	45
	Number with microfilaria.	5	16	17	1
	Percentage ..	..	12	4	...

PLATE II.

*Types of filarial lesions in areas of high endemicity.*



Fig. 1.—Elephantiasis—Cochin.

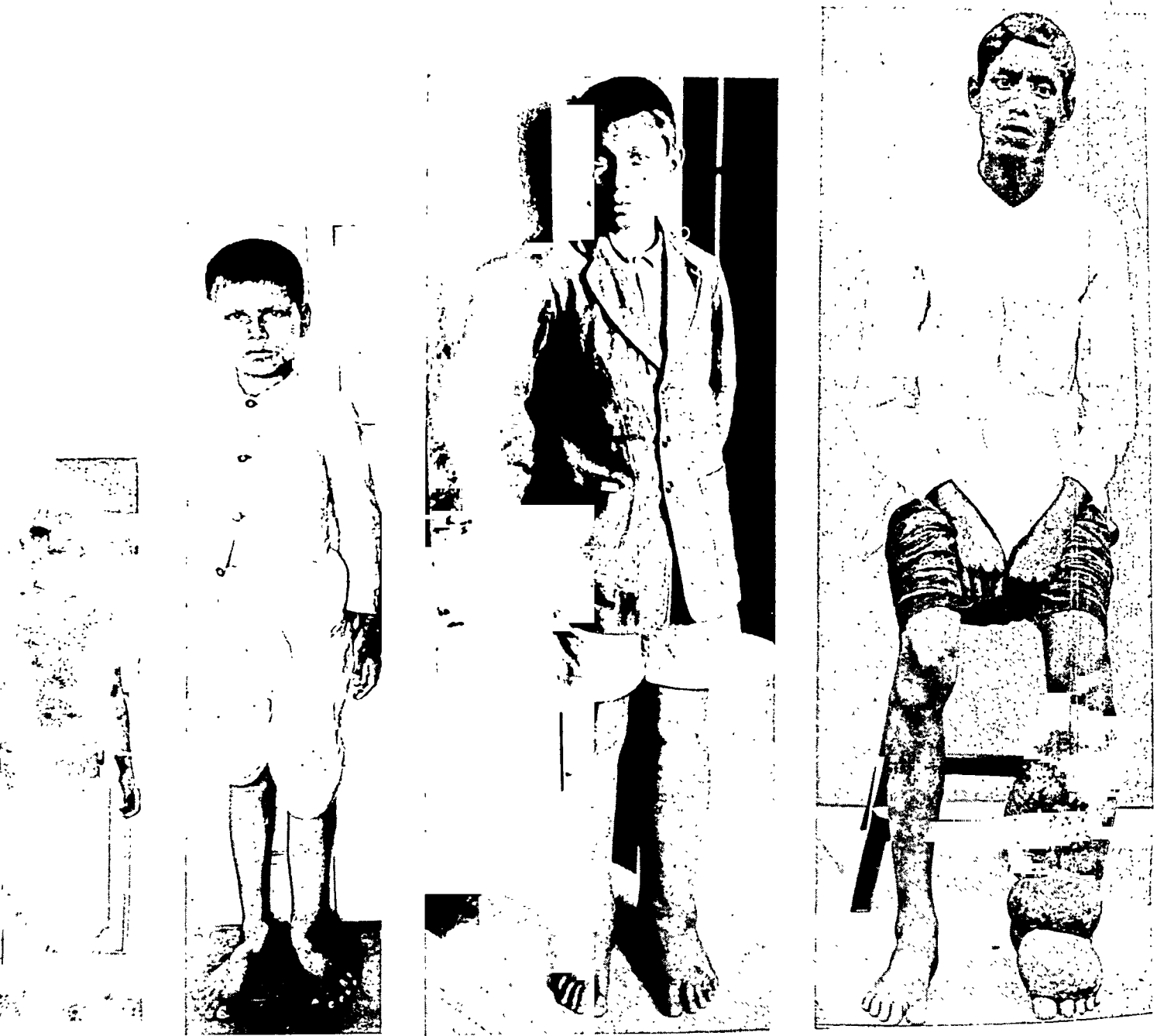


Fig. 2.—Elephantiasis—Cuttack.



PLATE III.

*Types of filarial lesions in areas of high endemicity.*



Figs. 3, 4, 5 and 6.—Show the result of lymphatic block at an early age.

We have studied the infection with special reference to age distribution in four of these areas, viz., Cochin, Cuttack, Calcutta and Allahabad. From the above table we see that Cochin and Cuttack show filarial infection at a comparatively early age (5 to 10 years), in Calcutta the infection is at a little later age, but in Allahabad the age incidence is very much later (18 to 20 years). The significance of these observations will be discussed later.

similar climatic conditions prevail the rate is not as high as in the three places mentioned above, but for Allahabad the statistics disclose a lower rate. The importance of this will be discussed later on.

#### Discussion.

From our observations in these different towns and from the statistics collected during the course of our work we are impressed with the

TABLE IV.  
*Age of onset of filarial diseases.*

	Total examined.	1—10	11—20	21—30	31—40	Above 40
Cochin .. .. .	51	2	20	27	4	1
Puri .. .. .	37	1	19	15	2	0
Cuttack .. .. .	727	2	382	256	53	34
Calcutta .. .. .	1,126	0	86	728	305	57
Purulia .. .. .	24	0	2	5	15	2
Allahabad .. .. .	35	0	1	7	22	5

The age incidence of the onset of lymphatic obstruction is always later than that of the microfilarial rate but varies with it. It is seen from the above table that the onset of filarial diseases in Cochin, Cuttack and Puri is early (6 to 10 years); in Calcutta and Purulia a little later (12 to 15 years); whereas in Allahabad it is very much later (20 years).

important rôle played by the period of exposure to frequent infections and the intensity of infection in relation to the *Culex* breeding season.

It was with this view that experiments were carried out (Rao and Iyengar, *loc. cit.*) in the laboratory to determine the optimum conditions of temperature and humidity for the development of the filarial embryo in its insect host.

TABLE V.  
*Microfilaria rate in normal persons and amongst cases of filarial diseases.*

		Normals.	Cases with elephantiasis.	Cases with all types of filarial diseases.
Cochin ..	Total examined ..	298	24	54
	Number showing microfilaria ..	60	1	2
	Percentage .. .. .	20.13	..	..
Puri ..	Total examined ..	200	17	37
	Number showing microfilaria ..	43	0	2
	Percentage .. .. .	21.5	0	..
Cuttack ..	Total examined ..	492	270	727
	Number showing microfilaria ..	125	16	86
	Percentage .. .. .	25.4	5.5	12
Calcutta ..	Total examined ..	762	608	1,126
	Number showing microfilaria ..	73	35	78
	Percentage .. .. .	9.6	6	7
Purulia ..	Total examined ..	340	12	24
	Number showing microfilaria ..	44	1	2
	Percentage .. .. .	12.9	..	..
Allahabad ..	Total examined ..	264	1	35
	Number showing microfilaria ..	18	0	4
	Percentage .. .. .	7	0	..

The microfilaria rate is higher in apparently normal people than in the persons suffering from filarial obstruction in Cochin, Puri and Cuttack. In Calcutta and Purulia where

We have shown how in Cochin where there are uniform climatic conditions almost all the year round, as well as physiographical and environmental conditions favouring *Culex* breeding,

and where the optimum meteorological conditions for the breeding of these mosquitoes happen to coincide completely with the optimum conditions for the development of the filarial embryos, the chances of infection are very great and marked lymphatic obstruction occurs. In the case of Puri, Cuttack and Purulia, the conditions are also somewhat similar, but the difference is due to the shorter duration of optimum conditions. Calcutta's optimum period is from July to November, but the *Culex* season in this town is from September to March, and this explains why the microfilaria rate is relatively low (9.6 per cent.).

In the section on filarial diseases we have described the mechanism of the various types of lymphatic obstruction. These differences in the clinical types of filarial lesions appear to be dependent upon locality, and some workers have suggested that these differences may be due to different species of filaria. Blood smears for microfilariæ obtained from the various endemic areas discussed in this paper, as well as from a number of other parts of India, show that there is only a single species of filaria causing lymphatic obstruction. As emphasised by us elsewhere (Acton and Rao, 1929) the theory that differences in the species of the parasite are responsible for the several types of filarial lesions in different localities may be dismissed once and for all. We have to seek the cause of the differences of these lesions in conditions other than the parasite factor.

The microfilaria rate and the types of lesions seen justify us in dividing these districts and towns into three groups, viz., hyperendemic, moderately and slightly endemic areas. We have briefly referred (Acton and Rao, 1929) to the correlation of these factors to the infective season. In hyperendemic areas such as Cochin, and parts of Puri and Cuttack, where the infective season extends almost throughout the year, the microfilaria rate was found to be 20 per cent. or over, and the age incidence from 6 to 10 years and upwards. The filariæ rarely reach maturity in the main abdominal lymphatics, so that hydrocele, chylocele and chyluria are not usually observed as the obstruction of inguinal or axillary lymphatic glands occurs very early in life. As the superficial lymphatic glands of the extremities are involved early in life, elephantoid lesions of the limbs predominate in these places (see Plate II, figs. 1 and 2). This is the result of exposure to intense infection, so that this heavy infestation with parasites brings about lymphatic obstruction even at an early age, following the intense irritation and subsequent pathological changes set up in these glands. The nearest glands along the lymphatics from the limbs undergo the grossest changes so that blockage occurs earliest in them, and septic infections only aggravate the patholo-

gical changes in the tissue below the obstruction and account for the predominance of the large elephantoid limbs. The legs being the most exposed part of the body to *Culex* bites become more commonly affected than the arms.

In the moderately endemic areas, the microfilaria rate is between 10 and 19 per cent. and the age incidence between 12 and 15 years. The filariæ may or may not reach the main abdominal lymphatic trunks. There may be partial or complete obstruction. In partial blockage, microfilariæ are found in the blood, and in complete blockage no microfilariæ are seen in the smears. As a consequence we see in these areas elephantoid limbs and scrotum as well as chyluria (see Plate IV, figs. 1 to 3). A moderately heavy infection results in comparatively marked changes in these glands which induces elephantoid lesions. When fewer embryos are inoculated into the system they can find their way as far up as the abdominal lymphatic glands, and obstruct the juxta-aortic glands, causing hydrocele, lymph-varix of the cord or chyluria, depending on the exact site of the obstruction.

In a low endemic area, the chances are that only a few embryos enter the system and these can always reach the lymphatic glands nearest the thoracic duct without ever having to obstruct the glands lower down in the lymphatic chain from the legs. The obstruction in the lymphatic glands is always located high up in the abdominal region, so that they may get blocked by inflammation, giving rise to hydrocele, lymph-varix of the cord, and chyluria, but never to enlargement of the limbs, etc. (see Plate V, figs. 1 to 3).

Sometimes we find, as in Cuttack, that there are some parts of the town where people are living under hyperendemic conditions, endemic conditions and conditions of low endemicity, so that we find all three types of lesions in one and the same place. In generalising about the type of lesion found in hyperendemic, endemic and low endemic areas, these statements are only true provided all the local conditions remain constant over that area, viz., the microfilaria rate, density of population, and number of *Culex*.

#### *Summary and conclusions.*

(1) The physiography, climatic and environmental conditions of six large towns in different parts of India have been carefully investigated by one of us (S. S. R.) in relation to the varying degrees of filarial endemicity.

(2) These areas have been further studied as subdivisions, i.e., wards, rural areas, etc., regarding local conditions.

(3) These towns and their subdivisions can be classified according to their microfilaria rate into three sub-classes: (a) hyperendemic areas where the microfilaria rate is 20 per cent. and over (b) endemic areas where the microfilaria

PLATE IV.  
*Types of filarial lesions in areas of moderate endemicity.*

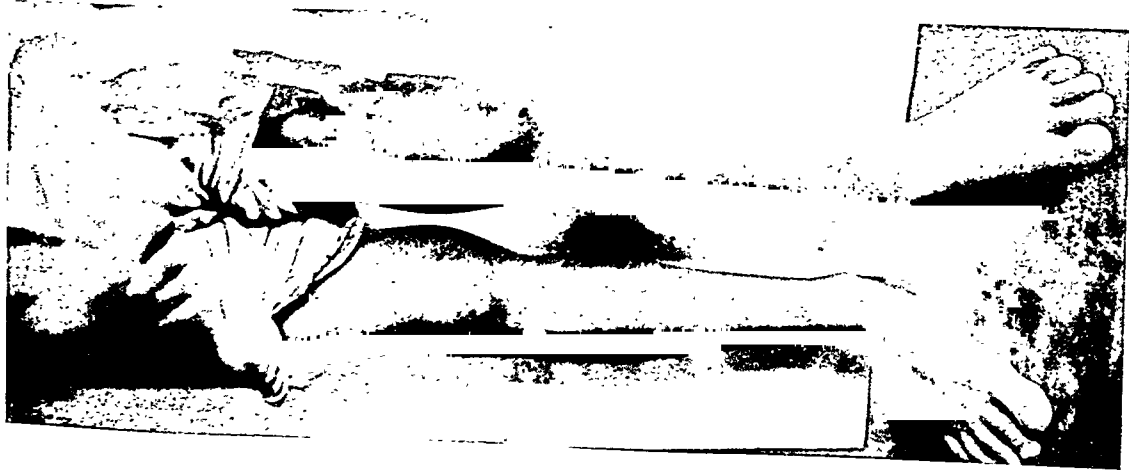


Fig. 1.—Elephantiasis of the leg (moderate).



Fig. 2.—Elephantiasis of the scrotum.



Fig. 3.—Elephantiasis of the penis. There was no elephantiasis of the limbs in these two cases (figs. 2 and 3).

PLATE V.  
*Types of filarial lesions in areas of low endemicity.*



Fig. 1.—Lymph-varix.



Fig. 2.—Chylocele.

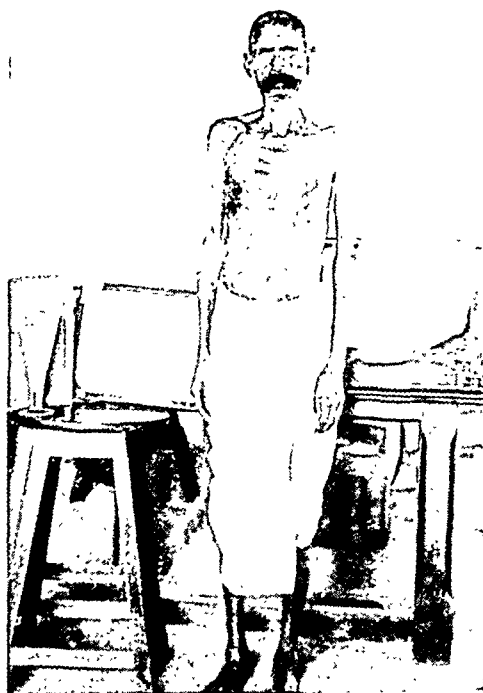


Fig. 3.—Chyluria.

rate is over 10 per cent. and under 20 per cent. and (c) areas of low endemicity where the microfilaria rate is under 10 per cent.

(4) The microfilaria rate is dependent on three factors, viz. (a) density of the permanent population; (b) the number of *Culex* present in the houses, and (c) the effective period for transmitting the infection coinciding with the *Culex* population.

(5) The factor regarding the human population is important from two points of view. Firstly, as regards its density, explaining the differences between the microfilaria rate in certain areas, i.e., urban and rural, and, secondly, towns like Puri where a large proportion of the population is a floating one, remaining only for a short period on account of religious festivals.

(6) Regarding the number of *Culex* present to transmit the disease, we have again to consider two factors: (a) the number of suitable breeding places such as sullage water, tanks, sumps, etc., with plenty of organic matter available for the larvæ, and (b) the particular time of the year when these places are suitable for the breeding of these mosquitoes.

(7) Sundar Rao and Iyengar (1930) have shown that temperature and humidity play a very important part in the length of time for complete metamorphosis of the filarial embryo in the mosquito; i.e., a relative humidity of over 60 per cent., and a temperature between 80° to 90°F. is the most favourable.

(8) This optimum temperature and humidity must correspond with the favourability for *Culex* breeding, and the longer the period of coincidence of all these factors the higher is the microfilaria rate; conversely the shorter the period of coincidence the lower the microfilaria rate.

(9) The age incidence of lymphatic obstruction varies with the conditions of intensity of infection under which the people are living; thus in hyperendemic areas the lesions commence commonly between the ages of 8 to 10, in endemic areas between 14 to 16, and in places of low endemicity between 20 to 30 years of age.

(10) The appearance of lymphatic obstruction generally coincides with the disappearance of microfilaria from the blood, except in chyluria when they are usually present.

(11) The site of the blockage of the lymphatics depends on the intensity of the infection in that particular area.

(12) In hyperendemic areas the first lesions seen are enlarged epitrochlear or inguinal glands, followed by filarial abscesses in the limbs and lymph varices around the glands, and still later by elephantoid lesions of the arms, legs, or breasts.

(13) In endemic areas the blockage may occur higher up so that hydroceles are common in young boys, and later on lymph varices of the cord. The superficial external inguinal

glands do not appear to be markedly affected; a collateral circulation is established between them and the internal inguinals, so that elephantiasis of the scrotum, penis and vulva is commonly seen. Usually only a moderate degree of elephantiasis of the limbs develops.

(14) In areas of low endemicity obstruction at the juxta-aortic glands is more common, so that hydrocele, lymph-varix of the cord and chyluria are very common.

(15) The changes in the gland obstruction vary in their pathology. In hyperendemic areas the large superficial lymphatic glands are replaced by an inflammatory granulation tissue containing numerous eosinophile cells, and around them are seen large dilated lymphatics containing adult filariae full of embryos, and yet none reach the circulating blood owing to the obstruction.

(16) In endemic areas these glands may from time to time become enlarged on account of the immature filariae passing through them, and scars gradually form, so that the gland is small and fibrous, and in the case of the inguinal glands a collateral circulation is established with the internal group draining the scrotum.

(17) In places where the infection is slight, the only lymphatic glands damaged are those situated high up in the abdomen, i.e., the juxta-aortics, for the few filariae that are inoculated from time to time can mature in this region and produce lesions.

(18) The authors (Acton and Rao, 1929) have shown that filarial obstruction is due to two causes, the irritation caused by the filarial toxin, and the result of secondary infection.

(19) Variations in the intensity of the lesions produced by *Filaria bancrofti* are dependent on two factors, namely, the degree of the helminthic infection, and the presence or absence of bacterial invasion of the tissues by cocci.

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#### CORRIGENDUM.

On p. 541 of our issue for October, 1930, the two illustrations were unfortunately transposed; the title of the illustration appearing in the first column should therefore read "Fig. 2.—Lymph-Scrotum" instead of "Fig. 1.—Elephantiasis of Scrotum," whereas that of the illustration in the second column should read "Fig. 1.—Elephantiasis of Scrotum," instead of "Fig. 2.—Lymph-Scrotum."—*Editor, I. M. G.*

### EARLY INFANT MORTALITY IN INDIA WITH SPECIAL REFERENCE TO PREMATURE BIRTH.

By MARGARET I. BALFOUR, C.B.E., M.B., C.M.

(An enquiry carried on under the auspices of the Indian Research Fund Association, Haffkine Institute, Bombay.)

THE high rate of infant mortality in India has for many years attracted attention. It is not easy to estimate the exact mortality owing to the doubtful accuracy of many Public Health statistics. The rate reported by the Commissioner for Public Health with the Government of India for 1927 was 167 per 1,000 births, and of these 49.54 per cent. took place during the first month of life. The rate for England and Wales for 1927 was 70 per 1,000 births, of which 32 per cent. took place during the first month of life. The Indian rates represent 23.7 per cent. and the English rates only 9 per cent. of the general mortality in the respective countries.(1) That is, the higher rate of infant mortality in India is not accounted for entirely by the increased risk of life generally in that country, but there are evidently special dangers other than those which affect later years of life and greater than those which affect infants in other countries.

These dangers, however, do affect infants in other countries though not perhaps to such an extent as in India. In most countries the mortality during the first month of life is about one-third of the total mortality for the first year. In 1917 a special report was published by the Medical Research Council(2) on the mortalities of birth, infancy and childhood, in which it is suggested that under the term infant mortality there are included two types—due to different causes—one, the developmental factors which vary little according to place, year and class, the other respiratory and intestinal diseases which are entirely preventable.

The developmental factors include premature birth, congenital malformation and atrophy, debility or marasmus; of these, premature birth is by far the largest class. The writer says, "we have now compared deaths from developmental conditions in urban and rural areas, in years of different meteorological conditions and in different social classes and we find a

remarkably constant rate running throughout. Mortality from this cause appears to bear almost no relation to the external environments of the mother—a very hot year does not send it up, rural conditions do not bring it down; and even if we assume that the statistical differences between the upper and middle classes and miners represent a real difference, the effect of the best social circumstances over the worst, is far smaller than that apparent in other causes in infant mortality. To the writer these facts seem to lead to the conclusion that the great bulk of these deaths are due to some obscure internal derangement of normal processes in the mother or infant which are either independent of the external environment or are due to some factor or factors in the external environment equally common among all classes and under all circumstances. We can write off a small proportion of these deaths in large towns as due to syphilis, but we know this is an inappreciable cause of prematurity in country districts. A few others are due to acute illnesses or accidents to mothers, but of by far the greater number of deaths from developmental conditions we do not know the cause and we do not know how to prevent this mortality . . . . . The deaths from developmental conditions in the first month appear to range from 25 to 30 per 1,000 births."

This was written in 1916 and if we follow the death rate from prematurity by statistics in later years we find the position is practically the same. In the year 1917 the deaths due to prematurity were 19.7 per cent. of the total infant mortality in England and Wales.(3) In 1927 they were 26.5 per cent. of the same total infant mortality. This does not necessarily mean that more deaths took place from prematurity, because, while the deaths from prematurity were 19.7 per 1,000 births in 1917, they were only 18.55 per 1,000 births in 1927. There was even a small decrease in prematurity, but while the general rate of infant mortality decreased from 96.48 in 1917 to 69.72 per 1,000 in 1927, the rate of death from prematurity had only decreased from 19.07 to 18.35 per 1,000. Had it decreased in the same proportion as the general infant mortality it should have come down to 13 per 1,000 births. It must be remembered, too, that premature birth is evidently due to two classes of causes. The first, known maternal conditions, such as toxæmia or placenta prævia; the second, unknown causes. It is possible that the apparent slight decrease in prematurity is due to the good effect of antenatal work in the treatment of maternal conditions such as toxæmia, and that the unknown conditions which account for the larger amount are unaffected or even increasing.

A report on neonatal death (Cruickshank) has been published recently by the Medical Research Council(4) which details the results

of post-mortem examinations of 800 neonatal deaths: 400 or 50 per cent. of the infants were premature. The author details and discusses the pathological conditions found. He refers to the importance of prematurity and says, "Prematurity is often due to ascertainable causes, such as maternal disease (heart lesions, pulmonary disease, infections of the urinary tract and so forth). In other cases it is attributable to the effects of toxæmia of pregnancy. Sometimes it is due to some complication such as accidental ante-partum hæmorrhage or hæmorrhage from placenta prævia. The effects of ecbotic drugs and accidental or deliberate violence or over-exertion must not be overlooked. *In a large proportion of cases, however, no cause for the premature labour can be found.*"

A report by Dame Janet Campbell on infant mortality has been published lately by the Ministry of Health(5) which gives an account of the enquiry (relating to England) carried on by the Health Organisation of the League of Nations. Of the 1,083 deaths investigated, 391 occurred during the first month of life: 189 of the live births were premature and of these 182 died within the month. In this connection Dame Janet Campbell says (after detailing maternal causes which might account for the prematurity), "But in not a few cases the cause of the premature birth was difficult even to guess at; maternal health was good, pregnancy appeared to have pursued a normal course, there was no apparent disease of the child, and even the common history of fright and shock, which is so often put forward in explanation was absent. Many of these unexplained births were primiparous."

These statements show that it is already recognised that prematurity is a large and important factor in neonatal mortality and that the causes which lead to prematurity are not fully understood.

My experience in India has given me the impression that prematurity is more frequent than in England and that possibly it may be an important cause of the higher infant mortality. The deaths due to premature births are not given separately in the Indian Public Health Reports, but together with the other developmental conditions include "infantile debility, malformations including premature birth." These conditions accounted for 44 per cent. of the total infant mortality in Bombay City during 1927.(6) The similar heading in the Registrar-General's Report for England and Wales shows that 39 per cent. of the total infant mortality in England and Wales was due to these causes; but while in Bombay 139 per 1,000 infants born died from these causes, in England only 27 per 1,000 so died.\* It is a big problem for India.

A significant remark is made by the Health Officer, Bombay, in the report from which these figures are taken, "the salient features are the magnitude of the rôle played by debility and prematurity in the causation of death in the first four weeks of life.....the high rates recorded suggest the presence in Bombay of some adverse factor in addition to the poverty and ignorance which are chiefly responsible in Western countries." It may be questioned whether the Health Officer is right in stating that poverty and ignorance are chiefly responsible for infant mortality in Western countries, but it is clear that the first month of life as a factor in infant mortality is even more important in India than in England.

While attending the Cama and Allbless Hospitals in Bombay recently in the course of an investigation on the anæmia of pregnancy I was struck by the number of feeble and immature infants born. Many of these died before leaving hospital and roughly speaking they appeared to die from the following causes:

- (1) some birth injury, which led to a fatal result owing to the feebleness and immaturity of the tissues;
- (2) some intercurrent disease which would not have affected a normal child;
- (3) mere inability to carry on the vital processes.

A post-mortem examination showing the pathological causes of death was of less importance in the matter of prevention, for the primary cause in most cases was prematurity or alternatively feebleness due to some maternal trouble, and I therefore determined to go a step further back and try to find out why the child was born feeble or premature.

Having ascertained that the average birth weight of healthy infants at the Cama Hospital was about 6.2 lbs. I began noting the condition of mothers and babies where the infant was 5½ lbs. or less. An endeavour was made to trace out the antenatal conditions, and the mothers were asked to bring the babies back at the end of three months to report. Unfortunately, scarcely one returned.

On this account a nurse was engaged to visit the infants in their homes. She attended the hospital each morning, found the under weight babies, took the address from the mother, and began visiting after the woman's discharge. Many difficulties were encountered. First, the woman sometimes could not give her address. Then, it was not always easy to find the street, the lane, the tenement and lastly the room in which she lived. Then, when this difficulty was surmounted, the nurse would arrive after a two or three weeks interval and find that the mother had "changed house" and no one knew the new address. Lastly, and frequently, the mother had gone "up country" to her village home and only occasionally did we rediscover her on her return.

\* Infant mortality, Bombay, 316 per 1,000.  
 Infant mortality, England, 70 per 1,000.

Another difficulty was the long distances it was necessary for the nurse to cover, since the patients came from all parts of Bombay. A scheme of this kind would be easier on a larger scale with a nurse for each quarter of the city. In the present case we were fortunate in our nurse, an Indian woman, who knew the city well and was very popular with the people. With one or two exceptions her visits were always welcome. We had hoped to carry on this scheme for a year, but lack of funds made it necessary to part with the nurse after eight months. By that time 242 infants with a birth weight of  $5\frac{1}{2}$  lbs. or under had been on our register. Of these 94 had been lost sight of and 148 had been followed up to the age of three months. Of these 37 had died—a mortality rate of 250 per 1,000 (in quarter of the year) among these feeble infants.

The infants were classified in three groups:—

1. Birth weight	5— $5\frac{1}{2}$ lbs.	80 cases.	5 deaths.	Death rate 62 per 1,000.
2. " "	4—5 " "	33 " "	11 " "	" " 333 " "
3. " "	below 4 " "	28 " "	21 " "	" " 840 " "

The rate of 250 per 1,000 at the end of three months is much higher than that given by the Executive Health Officer for the whole of Bombay (6). Unfortunately the figures for the first three months of the year are not given in the Annual Health Report but they are given for the first month (38 per cent. of 316) and also for the second to the end of the sixth month (35 per cent. of 316). The infant mortality of Bombay City up to the end of the sixth month is therefore at the rate of 233 per 1,000 and compares favourably with the mortality of the underweight babies which had already reached 250 per 1,000 at the end of three months. These babies represented 25 per cent. of the babies born at the Cama and Allbless Hospitals during that period. If this class could be eliminated, and especially the second and third groups, what an improvement would be effected in the infant mortality of Bombay City.

The information gained then, from watching the underweight infants, was that the first group with a birth weight of 5— $5\frac{1}{2}$  lbs. was doing well at the end of three months with a mortality rate of 62 per 1,000, as compared with a mortality rate of 120 per 1,000 at the end of one month for all births in the city as shown by the Health Officer's report. I interpret this as meaning, not that the majority of infants of the group were strong at birth but that their delivery and residence in hospital for the first ten days of life gave them a good start, sufficient to carry them through the dangers of the first three months. To illustrate this I may quote from a paper written by Dr. Jerbanoo Mistri (a Bombay medical woman) in 1924 detailing the conditions of delivery in the homes of the people. (7) "In the way of food a decoction of dill fruit and jaggery (raw

sugar) is given (to the mother) for the first 5 days. *Bajri conji* (a pudding made of millet and water) without any milk for another five days, and then gradually solid food. This goes on for twenty days. . . . During all this time the patient is kept confined to her corner without light and ventilation, roasted alive with the heat and on the above-mentioned highly nutritious diet. Nobody of course touches her. The child after delivery is then given some jaggery (raw sugar) and put in a corner of the room on a low stool to which all sorts of insects have access. . . . Among some of the Hindu communities no clothes are put on the child for forty days, even in the coldest weather." The child is not given the mother's breast for the first few days. Even then the milk, considering the mother's diet, is probably devoid of vitamins, and it can readily be understood that under these circumstances the death rate among

the feebler infants for the first month is very high. These infants in hospitals are kept in a good atmosphere, protected from insects, given the breast from the beginning, supplemented if necessary by a properly prepared bottle. The mother also is well fed and kept in a hygienic environment. By the time the child leaves hospital lactation is well established.

The infants below 5 lbs. had, on the contrary, a very much higher death rate than that shown for the city as a whole, therefore, when it became necessary to cease following up the underweight infants, I determined to pay more attention to the mothers of premature babies as I felt convinced that prematurity was an important factor in the rate of early infant mortality.

From August 1929 to March 1930 I examined 106 mothers who had given birth to premature infants at the Allbless Hospital. These were consecutive cases excluding stillbirths and represented about eleven per cent. of the hospital deliveries. In each case details of the mother's obstetric history and her condition during pregnancy were taken. A full examination of her blood was made immediately after delivery and it was tested by Kahn's method for syphilis. Dr. Lucy Wills kindly carried out an investigation of the diet of twenty-five of the mothers. The progress of the case and the result to mother and child was noted on discharge. To these 106 consecutive cases of premature birth I have added 59 cases of premature birth seen earlier in the same hospital, and of which a full examination of the blood was not made.

Through the kindness of Dame Louise McIlroy, Chief of the Obstetric and Gynaecological Unit of the Royal Free Hospital, London, I have been enabled to compare this series with

a series of 86 consecutive cases of premature live birth deliveries in the wards of the Royal Free Hospital.

The first point which strikes one is that a higher incidence of prematurity prevailed in the Indian as compared with the English Hospital. The rate in Bombay was 112 per 1,000 live deliveries as compared with 47 per 1,000 live deliveries in London. Some additional figures have been kindly supplied to me by medical women in charge of hospitals in England and some additional Indian figures.

TABLE I.

Source of information.	Number of live deliveries.	Number of live premature births.	Ratio per 1,000 deliveries.
Cama and Allbless, Bombay, 1929-30.	1,261	135	112.3
All-India Women's Hosp., Quest., 1929(S).	2,251	231	103.5
Royal Free Hosp., London, 1928-29.	1,868	88	47.1
Queen Charlotte's Hosp., London, 1924.	1,748	62	35.4
The Mothers' Hosp., Clapton, London, 1926-1929.	6,126	300	48.9
Elsie Inglis Hosp., Edinburgh, 1927-1930.	2,166	158	72.9

Table II shows the conditions during pregnancy which were associated with the prematurity in both countries:—

It must not be taken for granted that these conditions were identical with the causes of the prematurity. Most of the mothers were only seen after delivery, hence it is not possible to give any details of the condition during pregnancy other than the patient herself remembered. The blood, of course, had not been examined so there is no evidence if the "fever" was malarial, although it was probably so. But we know that any series of labour cases in Bombay questioned about their condition during pregnancy would report a number of cases of "fever," therefore we must not too hastily conclude that malaria is a marked cause of prematurity. I believe, from experience in studying the anæmia of pregnancy, that anæmia is a marked cause of prematurity. When the incidence of the conditions is examined in groups it will be seen that the incidence of toxæmia conditions and of intercurrent conditions was higher in England and, but for the high incidence of "fever" and anæmia in India, the Indian series would have shown a larger, instead of a smaller, proportion of mothers with "no symptoms."

In the Indian series three mothers died from cerebral malaria, anæmia, and toxæmia respectively. No maternal deaths took place in the English series.

In the Indian series 49 per cent. and in the English series 22 per cent. of the infants died before leaving hospital: 36 per cent. of the Indian series and 68 per cent. of the English series were primiparæ. The difference is probably due to a proportionately greater number

TABLE II.

Maternal condition.	ALLBLESS HOSPITAL, BOMBAY.			ROYAL FREE HOSPITAL, LONDON.		
	Number of cases.	Percentage.	Group.	Number of cases.	Percentage.	Group.
No symptoms .. .. .	67	40.11	40.11	46	53.48	53.48
Fever .. .. .	48	28.72	35.90	1	1.16	3.48
Anæmia .. .. .	12	7.18		2	2.32	
Toxæmia including						
(1) Eclampsia .. .. .	1	0.59	13.15	11	12.79	19.57
(2) High blood pressure .. .. .	12	7.18		3	3.48	
(3) Severe vomiting .. .. .	6	3.59		3	3.48	
(4) Accidental hæmorrhage .. .. .	3	1.79				
Placenta prævia .. .. .	2	1.19	1.19	4	4.65	4.65
Intercurrent including						
(1) Dysentery .. .. .	5	2.93	9.47	5	5.81	..
(2) Tubercular .. .. .	3	1.79				
(3) Pyelitis .. .. .	1	0.59				
(4) Injury .. .. .	2	1.19				
(5) Diarrhœa .. .. .	2	1.19	..	2	2.32	..
(6) Debility .. .. .	2	1.19		4	4.65	
(7) Headache .. .. .	1	0.59		1	1.16	
(8) Cardiac .. .. .				1	1.16	
(9) Hæmoptysis .. .. .				2	2.32	..
(10) B. coli infection .. .. .				1	1.16	
(11) Gonorrhœa .. .. .				1	1.16	..
(12) Hyperthyroidism .. .. .				1	1.16	
	167	99.82	..	86	99.86	..

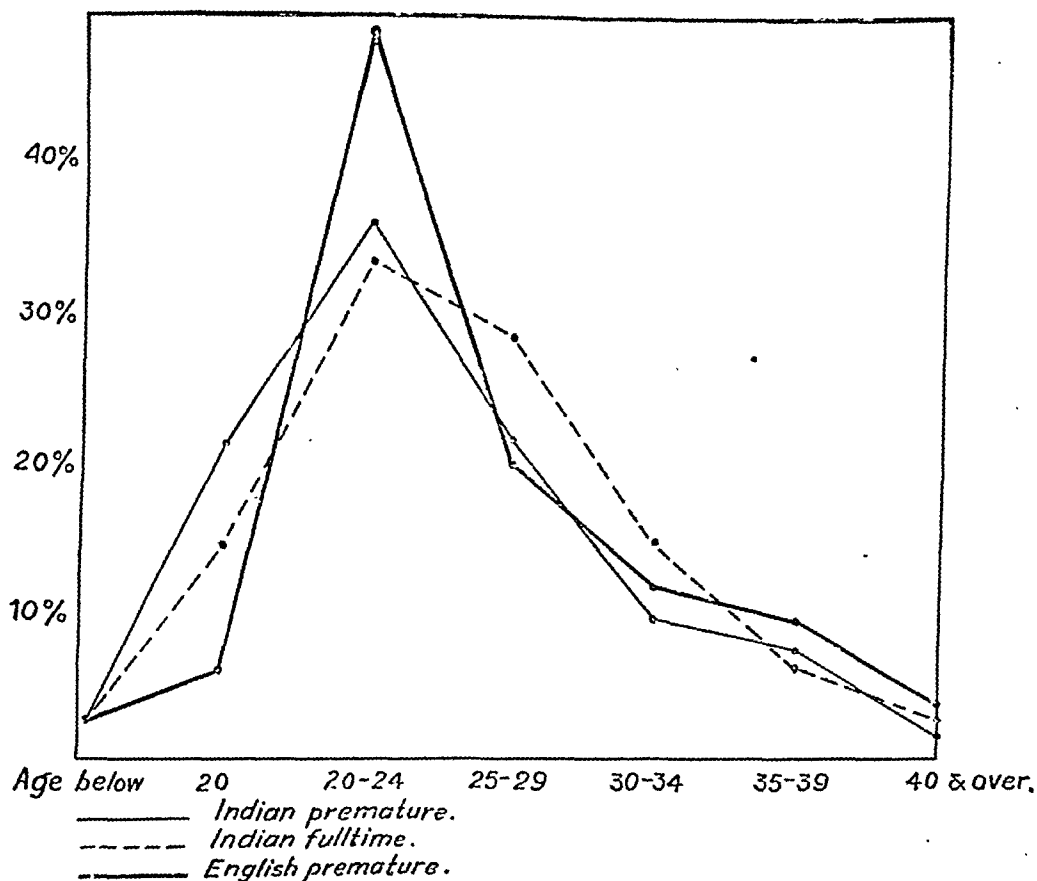
of first pregnancies in England. As regards age, when the cases were divided into five-year periods, the second period 20—24 formed the largest class in both countries.

2 per cent. of mothers and in the premature series 6.7 per cent. of mothers were below 17.

A full blood count was made in 105 cases. The average red cell count was 3,588,000 per

TABLE III.  
AGE OF MOTHERS.

			ALBLESS HOSPITAL.		ROYAL FREE HOSPITAL.		ALBLESS HOSPITAL.	
			Number.	Premature series. Percentage.	Number.	Premature series. Percentage.	Number.	Full time series. Percentage.
Below 20 years	..	..	22	21.1	5	5.8	71	14.2
20—24 years	..	..	38	36.5	41	48.2	169	33.8
25—29 "	..	..	24	21.3	17	20.0	144	28.8
30—34 "	..	..	10	9.6	11	12.9	74	14.8
35—39 "	..	..	8	7.6	8	9.4	31	6.2
40 and over	..	..	2	1.9	3	3.5	11	2.2
			104	98.0	85	99.8	500	100.0



There were not many cases of extreme youth among the Indian premature mothers—one mother was 15 and six were 16 years of age.

The ages of the Indian mothers in the premature series have been compared with the ages of a consecutive series of full time cases of labour (500) delivered in the same hospital, and the result is shown in the form of a graph. It will be seen that the Indian curves correspond fairly, but there is a distinctly higher proportion of mothers under 20 in the premature series indicating that extreme youth may be a predisposing cause. In the full time series

c.mm. and the white cell count 11,913 per c.mm. The examination was made shortly after labour when the physiological leucocytosis was still present. The series included 9 cases where the red blood count was below two million and these have been classified in the table as "anaemia." There were, however, as many as 30 cases with a red blood count below three millions. In the case of 31 mothers with "no symptoms" where a blood count was made, the average red cell count was 3,976,000, closely resembling that found by Wills in healthy mothers in Bombay(9).

Kahn's test was done in 65 cases, of which 9 or 12.1 per cent. were markedly positive. Kahn's test or the Wassermann test was done in 17 of the English cases, of which 2 or 11.7 per cent. were positive. In a series of 100 cases of normal labour in Bombay 14 per cent. were found positive. (10) Maternal syphilis was not, therefore, a marked cause of the prematurity.

I have been kindly supplied with some further particulars regarding premature infants by Dr. Christine Thomson, who has recently conducted an inquiry on stillbirth and neonatal death in India, and whose report is now in the press. Dr. Thomson's series of 200 post-mortems included 31 neonatal deaths of which 28 were premature. The following were reported as the primary causes of death in these 28 cases:—

Hydramnios .. ..	3
Maternal fever including smallpox and malaria .. ..	8
Maternal eclampsia .. ..	1
Maternal accidental hæmorrhage .. ..	3
Placenta prævia .. ..	1
Syphilis .. ..	2
Intra-placental or foetal hæmorrhage .. ..	5
Prematurity <i>per se</i> .. ..	5

If this is compared with Table II, it will be seen that it contains rather a smaller proportion of cases in which the mothers would relate "no symptoms"; only the last ten cases would come under that heading. This series of 28 premature births, however, differs from the first series in that the cases were not consecutive, the post-mortems being obtained when possible. The earlier the death occurred, the more possible was it to obtain a post-mortem. In this second series 68 per cent. of the infants died the first day. In the first series only 24 per cent. died the first day. Dr. Thomson's series evidently contained an unusual number of acute maternal conditions.

#### Discussion.

The facts detailed above then show that there is full agreement between the clinical notes and records of the hospital and the statistics of the Public Health Department as to the number of feeble and immature children born in Bombay City and the serious effect this has on infant mortality. It must not be forgotten that in this paper I have taken into account only live premature births and that there are also many premature stillbirths and many abortions before the child is viable. This not only means the loss of many potential lives but also the enfeeblement of the mother, who is deprived of the protection of lactation and too rapidly becomes pregnant again.

What is the cause of this state of things? It is sometimes said too frequent child bearing leads to feeble and immature children, but in this series of 167 cases of premature labour 61 per

cent. of the mothers were 1 or 2-para and only 9 per cent. were over 4-para. There is more foundation for another statement sometimes made that early motherhood leads to feeble children. Table III shows there is a slight but distinct increase in prematurity in mothers under 20. But countless mothers under 20 and even under 17 deliver healthy, full time children, therefore it is evident extreme youth can only be a predisposing cause. The same remark applies to malaria—many mothers suffer severely from this disease during pregnancy and deliver full-time children. The same applies to other of the maternal conditions noted in Table II and we must conclude that in most of these conditions there is some other cause which leads to the premature onset of labour or to the birth of feeble children, although the cause may be assisted or strengthened by the maternal disability.

The factors which lead to the onset of full time labour are not yet understood, but, excluding mechanical reasons, it appears to depend on a balance between various ductless glands, possibly related to pressure effects at full time. Can it be that the upsetting of the relations of the ductless glands is related to a deficiency in the mothers' diet?

Wills, working in Bombay, made an investigation of the diets of women of different classes, the results of which were published in the *Indian Journal of Medical Research* (11). One of the classes was composed of women who had given birth to premature children. It was found that all the women of the hospital class had a diet deficient in vitamins A, B and C when compared with the diet of Indian women of the upper classes. But in addition to this general deficiency, the diets of the mothers of premature infants, when compared with those of the mothers of the healthy hospital class, had a marked relative deficiency of vitamin B. This was found in 24 of the 25 cases investigated. The diet of these women, whether Hindus, Mahomedans or Christians consisted chiefly of polished rice or white bread. This was supplemented by vegetables. Wheat, dal, milk and ghee, when taken at all, were in small quantity.

It has been found by various workers that a maternal diet during lactation, deficient in vitamin B, leads to cessation of growth in the young rat. Sure (12) has found that the young albino rat, during lactation, requires 100 times as much vitamin B as vitamins A and D in order to keep up continuous growth, and considers that a large amount of the infant mortality in America due to gastro-intestinal disturbance, may be due to a B deficiency. It is not unlikely then that this vitamin may be equally important during intra-uterine life.

It may be that its deficiency leads to a failure of the growth impulse in the foetus, either directly or through the anterior pituitary or



sex hormone, and hence to the premature expulsion of the foetus, or to the full-time birth of feeble and puny children.

Another possibility is that a maternal deficiency of vitamin B may lead to premature thinning and separation of the decidua membrane.

It is sometimes held that abortion and premature birth are due, not so much to environmental causes, as to inherent weakness in the germ cells, the result of faulty nutrition of both parents(13). This is believed to occur in cases of early abortion where the germ cells have been weakened by a deficiency of vitamin E, and although fertilisation and implantation of the ovum takes place it is shortly followed by resorption of the ovum(14). It is not unlikely that in communities where certain dietary deficiencies are present inherent weakness of the germ cells may be a factor, as well as environmental conditions, in the premature stoppage of growth and the frequent premature expulsion of the foetus.

However this may be, the trend of this paper goes to show the great importance of scientific investigation of the causes of early infant mortality. More evidence is needed before we can take up the attitude that prematurity or feebleness at birth is due to a parental dietary deficiency, but there can be no doubt it is due to obscure antenatal causes which are not understood at present and are not being combated. Yet they are of the gravest importance to the well-being of the race. The first month of life may be compared to a well which draws its water from many sources (antenatal) and scatters it abroad (first year). It is here that the key to the problem of infant mortality will be found.

#### Summary.

1. A large proportion of infant mortality in all countries occurs during the first month of life, and of this a large proportion is due to feebleness or prematurity of the child, the cause of which is unknown.

2. The incidence of the birth of feeble and premature infants is much higher in India than in England and is a marked cause of the higher infant mortality.

3. There is evidently some antenatal factor leading to weakness either of the germ cells or of the developing foetus or of both; it is possible that this may be connected with a maternal or parental dietary deficiency.

I wish to express my thanks to Dr. D'Monte and Miss J. Jhirad, M.D., for clinical facilities kindly granted at the Allbless Hospital and also to my assistants Mrs. S. Talpade, M.B., and Miss H. B. Patel, M.B., for a great deal of valuable help in collecting the data given.

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## A Mirror of Hospital Practice.

### CANCER OF THE BREAST IN A MAN.

By M. UMAR, P.M.S.,

*District Hospital, Sitapur, Oudh.*

THE patient, a Hindu male aged about 50 years, was admitted to hospital with a fungating mass about the size of an orange with the skin adherent.

The condition started with "slight itch" about 3 years earlier and there was a very minute gland to begin with. No history of injury of any kind. No enlargement of any gland in the armpit.

The wound was cleaned and the tumour was removed, with a portion of the muscle also.

A piece of the tumour was sent to the Provincial Pathologist, United Provinces, Lucknow, and it was diagnosed as round-celled carcinoma.

### MULTIPLE INJURIES TO THE ABDOMINAL VISCERA.

By M. UMAR, P.M.S.,

*District Hospital, Sitapur, Oudh.*

A WOMAN after being severely beaten by her husband was found dead some hours later.

*Post-mortem examination.*—The only external injury noted was an ecchymosis over the right eye. The brain and thoracic organs were normal. The abdomen was found full of blood. The liver had two rents in it, one on the dome and the other on the anterior border, both about an inch in length. The spleen was slightly enlarged and there were three tears in it, and the right kidney had a tear, one and a half inches in length on its convex border.

# Indian Medical Gazette.

NOVEMBER.

## NARCOSIS IN CHILDBIRTH.

MODERN surgery rests on the twin foundations of asepsis and anæsthesia. With regard to obstetrics, the modern doctor attempts to make the conditions of delivery as aseptic as possible, but the study of anæsthesia in labour has hardly as yet been begun. This is the more surprising since differing degrees of narcosis or anæsthesia may be wanted under different circumstances, from a mild anæsthesia in the second stage to full surgical anæsthesia for manipulative or instrumental delivery. In this connection two papers recently published call for review, for they are notable contributions to the subject.

The first is by Dr. Bourne of Queen Charlotte's Hospital and Dr. Burn, Director of the Pharmacological Laboratories of the Pharmaceutical Society of Great Britain (*Brit. Med. Journ.*, 19th July, 1930, p. 87). This deals with the action on the uterus of anæsthetics and other drugs commonly used in labour. The authors have invented a simple apparatus, consisting of a disc-shaped rubber bag attached to the end of a gum-elastic catheter, and connected by a long rubber tube to a mercury manometer, for recording graphically the changes in the intra-uterine pressure. The bag is filled with water, and after careful sterilisation is inserted with full aseptic precautions through the os uteri so as to lie between the membranes and the wall of the uterus in a position well past the head of the fœtus; the contractions of the uterus thus come to be recorded by the mercurial manometer. With this apparatus the authors investigated the action of different anæsthetics.

With chloroform there was complete inhibition of the pains, when administered during the first stage of labour; when administered for 25 minutes during the second stage of labour the contractions were immediately lessened in force and slowed down, and there were none at all during the last 15 minutes. Within 2 minutes of removal of the mask, however, the pains had returned in full force. In brief, the arresting effect comes on rapidly, but also passes off as rapidly. Ether gave similar results to chloroform. The authors conclude that both chloroform and ether are ideal agents whenever a temporary brake-like action on too powerful or too painful expulsive forces is required.

With nitrous oxide and oxygen, administered for 20 minutes, there was no appreciable effect

on the contractions; "gas and oxygen," therefore, is an anæsthetic which anæsthetizes without interfering with the progress of labour.

Spinal anæsthesia was tested on one patient by the injection of 0.05 gramme of stovaine. It was found that this did not inhibit the contractions, but it interferes with full relaxation between the pains. This appears to be due to continuous contraction of the lower segment of the uterus, and if stovaine be given early in the first stage dilatation will be delayed.

Morphine has an important rôle in labour. After hypodermic injection of gr.  $\frac{1}{4}$  during the first stage, the frequency of the contractions becomes much slower than before, and the period of relaxation after each contraction is prolonged. It markedly relieves the continuous pain associated with dilatation of the os, and at the same time prolongs the contraction action; hence it may accelerate and render less painful the first stage of labour. Atropine, in a dose of gr.  $\frac{1}{100}$ th, caused no inhibition at all of the contractions; if anything it stimulates them. The stimulant action of quinine, which medical men are apt to rely on so much, is very slight indeed; the contractions may become more frequent, but they are not so severe. The authors conclude that the powerful action of quinine on isolated portions of smooth muscle when suspended in a bath is but little guide to its effect on the human uterus in labour.

In discussing their results, the authors comment on the suitability of these different drugs. Chloroform is apt to cause death from cardiac fibrillation or from delayed chloroform poisoning; the use of ether is apt to be followed by pulmonary complications. Gas and oxygen is rarely available in ordinary practice, is expensive, and ordinarily will not give full surgical anæsthesia. For light anæsthesia at the end of the second stage they consider that chloroform and ether are equally suitable. In a consecutive series of 562 cases in which this was used there was no appreciable prolongation of the second stage, no increase in post-partum hæmorrhage, and a reduction in the number of cases with perineal tears. For prolonged light anæsthesia during the whole of the second stage gas and oxygen is the theoretical ideal, but in actual practice chloroform or ether will usually have to be administered, though the doctor should remember to cut down the amount administered to the minimum. When full surgical anæsthesia is required, ether is the anæsthetic of choice, but its inflammable properties must be remembered. "From the point of view of the patient there seems little doubt that the use of chloroform is not in keeping with modern enlightenment."

The second paper is one by Mr. J. S. M. Connell, F.R.C.S. (Ed.), late obstetric officer at the Dudley Road Hospital, Birmingham, on the use of Avertin in childbirth (*Lancet*, 26th July, 1930, p. 184). The author comments on the

often disastrous psychological effects of her first labour on a patient; the recollection of the devastating pains will sometimes make her try every possible measure to avoid a second pregnancy, and should she become pregnant a second time her mental state is often pitiable, and she may seek some means of abortion. Any agency which is both safe and effective in relieving the pains of labour should therefore prove a godsend to parturient women and the attendant general practitioner.

The author finds that Avertin will not produce full surgical anæsthesia, but it will make things so easy for the patient that she has no devastating pain, no prolonged backache, no exhaustion, and no memory of a terrible experience to jaundice her outlook on life. The technique for administration of Avertin is as follows:—

#### *Technique.*

The technique is simple. The apparatus required consists of: (1) a graduated glass cylinder to hold about 300 c.cm., with cork for same; (2) a small measure, say 10 c.cm.; (3) a funnel with tubing about three feet, ending in a glass connection to join with, (4) a No. 6 catheter; (5) a thermometer, F.; (6) a small bottle of 1–1000 Congo red solution; (7) a bottle of distilled water, say 1000 c.cm.; (8) Avertin fluid.

The preparation of the injection is as follows:—

Into graduated measure (1) put about 160 c.cm. distilled water. By immersing this in a jug or other vessel of hot water, raise the temperature to 100° F. Measure 0.075 c.cm. of Avertin fluid per kg. of body-weight. (This has frequently to be guessed, but it is not essential to be exact.) For example, 9 st. equal 126 lb., equal roughly to 60 kg. Sixty times 0.075 c.cm. equal 4.5 c.cm. Add this to the distilled water, insert cork and shake vigorously. (It is important first to raise the temperature to 100° F., or solution is delayed.) Take a few c.cm., say 5, of solution back into the small measure and add a couple of drops of Congo red solution. The colour *must not* change. I have never found a blue discoloration, showing presence of free dibromacetaldehyde. The temperature should again be raised to 100° F., and the solution is ready for use. Just after a good long strong contraction has passed, a catheter should be inserted high into the rectum and about 50 c.cm. run in fairly quickly. When the next contraction comes it is usually a small one, but strong pressure must be made round the anus, and the patient told *not* to bear down, or much of the fluid may be lost. There is seldom any difficulty in retaining the bulk of it.

After the first contraction is over, the rest of the Avertin solution should be passed in, the process extending over about 15 minutes, and firm pressure being applied to the anus during a pain. By this time, however, the patient is probably asleep and does not bear down strongly. The fluid soon makes its way up past the point where the child's head is pressing on the rectum, and after about half an hour from the commencement of the injection there is no tendency for any to return.

The author gives a table of 10 cases treated with Avertin, including two with albuminuria, and one where version had to be performed under general anæsthesia. He then gives the following account of a typical case:—

#### *A typical case.*

The course of a typical case of Avertin anæsthesia in a normal primipara is as follows:—

The patient commences labour and either goes into hospital or nursing home, or sends for the doctor and

midwife. As soon as a show or one finger dilatation of the os, with good regular contractions, has established the diagnosis, a quarter grain of morphia is given. Less morphia should not be given, as in some cases it has only the effect of increasing the excitement and distress of the patient, and strengthening the contractions. In a few cases another sixth of morphia is required, especially in primiparae over 30, but commonly the effect lasts until a quiet dilatation has taken place in 6 to 12 hours. Occasional examination per rectum will give an indication of progress, but these are mostly unnecessary. Membranes of a normal toughness with a well-fitting head will not rupture until the os is about two-thirds dilated and on this rupture the doctor should again be called. At this point also the patient begins second stage pains, bearing down and complaining of severe backache. This is the time to give the Avertin, and not before. The patient should be allowed to realise the severe pain that accompanies the descent of the head, in order that she may more fully appreciate the benefit of the comparative ease thereafter. With multiparae, the optimum time for giving the Avertin is less exact. It is better to anticipate the rupture of the membranes. In many cases there will not be time to give the preliminary morphia, and it is less necessary here. Avertin should be given when the cervix is fully half dilated, if the contractions are strong and regular. If they are not it is as well to wait until they are—probably another hour or so. The patient is then left to herself, the doctor having satisfied himself during half an hour that the pulse-rate, the respiration-rate, and, if he likes, the blood pressure are in good order. The administration of Avertin may be accompanied by a short period of excitement if, in multiparae, a previous injection of morphia has not been given. But this does not last more than five to ten minutes, and is usually entirely absent after morphia. The patient is asleep within five minutes in the majority of cases, although she may be roused to speak.

It is generally recognised that morphia should not be administered within two hours of the birth of the child, and Avertin should not be given until two hours have elapsed after the morphia. The action of morphia in childbirth is very variable, but the usual slow dilatation in primiparae gives ample time for such intervals to be attained. The rare case of precipitate labour in a primipara is easily recognized by the early prolonged and powerful contractions, and by the fact that the cervix is much further dilated than usual when first the doctor sees the case. It would then be treated like a multipara and the morphia omitted.

It is obviously of benefit to carry out all subsequent procedures quietly and gently. In nervous and excitable people full sleep may not ensue for 10 to 20 minutes. In certain cases in hospital and most cases in private, I have returned shortly before the "crowning" of the head, to give either a few drops of ether, or gas and oxygen, in order that the patient may have no recollection whatever of the birth of her child. In primiparae this is useful, but in multiparae quite unnecessary. If it is omitted, however, and the effect of the Avertin is diminishing, the patient may become very restless and even uncontrolled during the passage of the head over the perineum. This has in a few cases made it difficult to "support the perineum" (a process which I consider really useless).

In summing up the results with Avertin narcosis, Mr. Connell finds that the dosage used, 0.075 c.c. per kilo. body weight, is perfectly safe; the patient, however, must not be left alone as she is in a state of deep coma. Any trained midwife however can see to that. There is a slight fall in blood pressure, but nothing serious. The narcosis lasts for 2 to 4 hours, and usually a second injection is not necessary. The condition of the child at birth is excellent. There is not the anxiety usually present when

scopolamine and morphine have been used. The mother is not exhausted, sleeps naturally for some hours after parturition, and awakens in normal healthy condition. Labour is a little prolonged, a second stage of 4.6 hours as against an average of 3.7 hours for unassisted labour. Finally, the apparatus needed is simple and easily packed into the obstetric bag. A most important feature of Avertin narcosis is that it will very frequently avoid the necessity for a forceps delivery, and the medical attendant is not incessantly worried by the relatives to terminate the delivery by instrumental means in order to relieve the distress of the patient.

The publication of these two interesting papers shows that the subject of narcosis in childbirth is at last receiving the attention which so very important a subject merits.

### JUNGLE AND MALARIA IN BENGAL.

It is a very common belief that tropical jungles are especially associated with intense malaria. Like many other popular beliefs, however, this is only partly true. The best example of it, perhaps, is in Sir Malcom Watson's account of the *Prevention of Malaria in the Federated Malay States*. Here the virgin jungle of both the coastal plains and the inland hill tracts is full of *Anopheles umbrosus*, a fierce man-eater both by day and night, and a species which has been shown to transmit malaria. In the hill tracts when jungle is cleared, *A. umbrosus* disappears, but only to be replaced by *A. maculatus*, an even worse transmitter. Hence the peculiar difficulty of the conditions in Malaya, and the special merit of the very fine anti-malarial measures carried out there by Sir Malcolm Watson and his colleagues. The success of the anti-malarial measures in Malaya in fact has been even greater than that of the measures in Panama, when the relative difficulties in the two countries come to be considered.

Jungle, however, is not always associated with malaria; in fact in some areas the reverse holds true. This is especially well brought out in a recent paper by Mr. M. O. T. Iyengar, Entomologist to the Public Health Department of Bengal.\*

The author defines "jungle" as uninhabited land covered by forest trees, shrubs or thick brushwood, tall and thick enough to produce shade and prevent the exposure of the land surface to sunlight to any appreciable degree.

\*Iyengar, M. O. T. (1930). Jungle in relation to malaria in Bengal. *Indian Journ. Med. Res.*, July 1930, Vol. XVIII, No. 1, p. 259. (Mr. Iyengar has recently been awarded the Minto Medal of the Calcutta School of Tropical Medicine and Hygiene for his researches in malariology and the parasites of mosquitoes. This is a gold medal awarded annually "for distinguished research work in tropical medicine by an Indian worker," under an endowment given by Lady Minto in memory of the late Lord Minto, formerly Viceroy of India.)

"Scrub-jungle," consisting of struggling low lying shrubs and savannahs, he excludes.

In Bengal there are roughly three zones of jungle; the hill jungles of the north; the sub-montane jungles of the Terai and the Duars—districts notorious for their malaria; and the mangrove jungles of the Sunderbans, the estuarine area of Bengal. The first, hill jungle, is completely free from malaria. Here the only anophelines found were *A. gigas* var. *simlensis*, *A. aitkeni*, *A. lindesayi*, and *A. annandalei*, none of which is known to transmit malaria.

In the submontane tract, Mr. Iyengar studied the conditions present in seven different areas. To the north of Meenglas and Dalinkote, in the hyperendemic area in the Duars, the jungle is quite close to the tea estates, and is traversed by numerous streams during the rains. Within the jungle itself the only anophelines found breeding were *A. aitkeni* and *A. barbirostris*, which are innocuous; but the moment clearings in the jungle are entered, the anopheline picture changes, and *A. maculatus*, *A. minimus*, *A. culicifacies*—all three notorious carriers,—with *A. jeyporiensis*, *A. jamesi*, and *A. majidi* are found. The coolie lines nearest the jungle are the least malarious, those situated in the middle of the open area have breeding of carrier species going on on all sides around them. Madarihat, in the Duars, situated in a clearing in the jungle area, is notorious for its malaria. Here within the jungle itself only *A. barbirostris* and *A. leucosphyrus* were found, whereas in the cleared area *A. minimus*, *A. maculatus*, *A. culicifacies*, *A. fuliginosus* and *A. sinensis* were all breeding. At Sukna in the Darjeeling Terai, the non-transmitting species found in the jungle were found to be replaced in the cleared area by such well-known carriers as *A. maculatus*, *A. minimus*, *A. fuliginosus*, *A. maculipalpis*, and *A. philippinensis*. Wherever deforestation is carried out, the harmless jungle species of *Anopheles* disappear and are replaced by the dangerous carrier species. At Rajabhatkhawa in the Jalpaiguri district, with a spleen rate of over 90 per cent., *A. maculatus* and *A. minimus* are breeding freely in the cleared area, but cannot be found a few yards within the jungle. At Rangamati in the Chittagong Hill Tracts, the District Medical Officer suggested jungle clearance in order to reduce the malaria for which this place is notorious. Here Mr. Iyengar found spleen rates of from 70 to 90 per cent., but the anopheline species within the jungle were perfectly harmless, whereas seepages, streams and ponds within the station were breeding *A. karwari*, *A. fuliginosus*, *A. philippinensis*, and *A. jamesi*. In place of cutting down jungle, Mr. Iyengar recommends the extension of jungle to cover in the seepages and streams in the valleys.

The Sunderbans are well known to all who have arrived at Calcutta by steamer from overseas. They are a maze of islands cut up by

tidal channels in the estuary of the Hughli. Part of the area has been cleared of jungle and is under rice cultivation, while part of it is covered by dense jungle. Most of the land is below spring tide level, and is subject to tidal flooding except where protected by embankments in parts of the opened up area. The Sunderbans are a well-known resort for sportsmen; tiger are abundant, and many a 'shikari' has gone from Calcutta on a tiger shoot in the Sunderbans, only to return saturated with malaria.

Here Mr. Iyengar found conditions to be extraordinarily interesting. The staff of the Forest Department posted in the interior of the Sunderbans jungle live in small floating flats anchored in creeks and channels. A search of these and of the huts of the aboriginal Boali living in the interior of the jungle failed to yield even a single anopheline. In the cleared area, however, *A. ludlowi*—the great malaria carrier of the Andamans—is everywhere breeding profusely. Here cattle are not able to stay out after sunset; they are driven into cattle sheds protected by mosquito gauze over the small windows, and smoked out daily in the early evening in order to protect them from mosquitoes. Poor as the inhabitants of these areas are, yet even the very poorest are provided with mosquito nets, and get under the curtain as early as possible after sunset. Mr. Iyengar found that the best way to protect himself against malaria was to take his boat before sunset into the uncleared jungle area, and spend the night there. "Actually, the jungle forms a definite protection against the breeding of *A. ludlowi*, the important carrier species of the region. The cleared areas on the other hand abound with this species, and some parts are very malarious. . . . The species of *Anopheles* known to transmit malaria parasites in Nature are all species closely associated with man or with his activities. Jungle anophelines which breed inside jungle and normally feed on jungle animals have ordinarily very poor chances of getting an infective feed of malaria. Even if it should chance that some of them get an infective feed, the chances of transmission of the parasites to a human being are very remote. It is impossible, therefore, to conceive of any jungle anophelines playing an appreciable part in the epidemiology of malaria."

To conclude, in Bengal it is not the jungle, but Man who introduces malaria into such areas, and causes conditions favourable for the breeding of carrier species. In view of Mr. Iyengar's findings, it is rather amusing to reflect that several years ago a serious proposal was made to the Indian Research Fund Association to spend a very large sum of money on jungle clearing in Bengal as an experimental measure, in order to see whether it would not reduce the incidence of malaria. Fortunately, the proposal was turned down.

## THE DRUGS ENQUIRY COMMITTEE, INDIA, 1930.

IN a recent editorial (*Indian Medical Gazette*, Vol. LXIV, 1929, p. 389) we have dealt fully with the present most unsatisfactory state of affairs in India with regard to the preparation and sale of drugs. Fraudulent imitations abound on the Indian market, and the only remedy appears to be for the firms whose drugs are imitated to take legal action. "Cinchona febrifuge" may consist of anything from sodium bicarbonate to concrete. Santonin is often badly adulterated on the Indian market. Further, there is no standard for such potent and important remedies as the pentavalent compounds of antimony so widely used in the treatment of kala-azar; preparations of digitalis, even when made by well-known firms in Europe and America, may degenerate under tropical conditions; and arsenical preparations for the treatment of syphilis and yaws are tested only in the stocks held by Medical Store Departments. The position in fact is one in which neither chemist, doctor, nor patient can be certain that what is being prescribed is being dispensed, and taken by the patient. Several of the well-known chemical firms in India have established laboratories to deal with this state of affairs, to examine and test the products which they import or manufacture, but they constitute the honourable exception and not the rule. "Bazaar medicine" is all prevalent, and the present unfortunate boycott of British made and reliable drugs still further adds to the difficulties of physician and patient in obtaining reliable and efficient medicinal remedies.

Under these circumstances, we are very glad to learn that the Government of India have set up a Drugs Enquiry Committee, India, with very wide terms of reference. We trust that our readers throughout India will do their utmost to facilitate the very important work of this Committee, for the whole future of medical work in this country may turn upon their findings.

The following is the official Government resolution in which the terms of reference of the Committee are set forth:—

No. 1637-Health.

Government of India.

Department of Education, Health and Lands.  
Simla, the 11th August, 1930.

### Resolution.

In pursuance of a resolution which was adopted by the Council of State in March, 1927, recommending the Governor-General in Council to urge all Provincial Governments to take such steps as may be possible to control the indiscriminate use of medicinal drugs and to legislate for the standardisation of the preparation and for the sale of such drugs, the Government of India, after consulting and with the approval of local Governments, have decided to appoint a small Committee to explore and define the scope of the problem, and to make recommendations as to the measures which should be taken.

2. The terms of reference to the Committee will be as follows:—

"(1) To enquire into the extent to which drugs and chemicals of impure quality or defective strength, particularly those recognised by the *British Pharmacopæia*, are imported, manufactured or sold in British India, and the necessity, in the public interest, of controlling such importation, manufacture and sale, and to make recommendations;

(2) To report how far the recommendations made in (1) may be extended to known and approved medicinal preparations other than those referred to above, and to medicines made from indigenous drugs and chemicals; and

(3) To enquire into the necessity for legislation to restrict the profession of pharmacy to duly qualified persons, and to make recommendations."

3. The Committee will be composed as follows:—

#### Chairman.

(1) Lieut.-Col. R. N. Chopra, M.A., M.D. (Cantab.), L.R.C.P. (Lond.), M.R.C.S. (Eng.), I.M.S., Professor of Pharmacology, School of Tropical Medicine and Hygiene, Calcutta.

#### Members.

(2) The Revd. Father J. F. Caius, S.J., Pharmacologist at the Hafikine Institute, Bombay.

(3) Mr. H. C. Cooper, Ph.C., F.C.S., of Messrs. Smith, Stanistreet & Co., Ltd., Manufacturing Chemists, Calcutta.

(4) Maulvi Abdul Matin Chaudhury, M.L.S.

(5) A secretary, whose name will be announced later.

4. The necessity for some measures of this description is obvious, equally from the point of view of the manufacturer and dealer who wishes to carry on his business honestly, the medical man who expects results from the medicine he prescribes, and the consumer who is dependent upon both. It is well known that many unscrupulous people, realising that to analyse and standardise medicinal preparations requires experienced men and expensive and elaborate laboratory equipment, take advantage of this knowledge to carry out extensive adulteration, use inferior drugs, and in the case where raw material is expensive, purposely reduce the quantity that should be used in order to sell it at a low price. This is not only carried out in India but some European firms export medicines specially manufactured for the eastern bazaars.

5. The Committee desire to have the views of all persons, associations or bodies interested in this question with respect to the points mentioned in the terms of reference. With a view to elucidate the different aspects of this problem they have drawn up a questionnaire, a copy of which is attached herewith. These questions have been drawn up with the sole object of eliciting information and it is hoped that a detailed reply will be sent to these, supported by arguments and statistics wherever possible.

6. The Committee will have the power to co-opt members when necessary. It will also visit important centres in different provinces and will take evidence on the questions stated in the terms of reference and on the questionnaire which is being issued.

7. Replies to the questionnaire and all other communications should be addressed to the Secretary, Drugs Enquiry Committee, School of Tropical Medicine, Calcutta.

The Committee have already drafted a preliminary questionnaire to be circulated to the whole of the medical profession in India. We would appeal to those of our readers who are in a position to do so, to furnish information to the Committee on these important points. The questionnaire is as follows:—

#### Questionnaire for the medical profession.

1. Have you any occasion to think that your patients are getting drugs and chemicals of defective strength and impure quality?

2. What personal experience have you of adulteration or inferior quality in medicinal preparations? Please give details:

- (a) Pharmacopœial preparations.
- (b) Proprietary preparations.

#### Indian manufacture.

##### Inferior quality.

##### Adulterated.

3. What is your opinion regarding the biological products offered for sale in India? Have you ever had any reason to believe that they are not of the proper strength?

4. Do you feel that there ought to be some legislation to control the potency and purity of drugs and chemicals manufactured locally and imported from abroad?

5. Do you consider that control of therapeutic agents on the lines enacted in such countries as Great Britain, United States of America, etc., is desirable in this country?

6. If not, what suggestions have you to put forward regarding such control?

7. What is your opinion regarding standardisation of various preparations made from drugs used in the indigenous medicines, on the Indian market? Do you use them much?

8. Are you aware of any cases where such preparations were proved to be inactive or harmful? Do you think it is possible to control them in the same way as the pharmacopœial preparations?

9. What is your opinion regarding the increasing sale of proprietary remedies, particularly those with secret formula, on the Indian market? What control in your opinion should be exercised over them?

10. Have you had any experience of inaccurate dispensing?

11. Have you any other remarks to make with regard to the purity of drugs in general or any other matters in this connection?

#### 1. To be answered by manufacturers of drugs and chemicals.

1. State as nearly as possible your annual output of the following:—

- (a) Tinctures and other spirituous preparations.
- (b) Liquid Extracts.
- (c) Solid Extracts.
- (d) Mineral Acids.
- (e) Inorganic Chemicals.
- (f) Organic Chemicals.
- (g) Alkaloids.
- (h) Organic Antimony and Arsenic compounds.
- (i) Organo-therapeutic products.
- (j) Vaccines and Sera.
- (k) Proprietary Liquid preparations.
- (l) Proprietary Solid preparations.
- (m) Any other liquid preparations.
- (n) Any other solid preparations.

2. What difficulties do you experience from the following causes:—

- (a) In obtaining indigenous raw materials of standard quality?
- (b) Due to Customs and Excise regulations.
- (c) In connection with any other factors in the drug manufacturing trade.

3. What arrangements have you for the biological control of preparations which cannot be standardised chemically?

4. How do you obtain your raw materials? What arrangements have you for the analytical control of such material and the finished products you manufacture?

5. State the names and qualifications of all chemists you employ?

6. How many employees have you in the factory and laboratories?



7. Do you think samples of raw materials and finished products should be examined at a Central Laboratory?

## II. To be answered by importers and dealers.

1. State as nearly as possible the quantity imported per annum, approximate value and country of origin of the following:—

Quantity imported per annum.	Value.	Country of origin.
(a) Tinctures and Spirits.		
(b) Liquid Extracts.		
(c) Solid Extracts.		
(d) Mineral Acids.		
(e) Inorganic Chemicals.		
(f) Organic Chemicals.		
(g) Alkaloids.		
(h) Organic Antimony and Arsenic compounds.		
(i) Organo-therapeutic products.		
(j) Vaccines and Sera.		
(k) British Proprietarys.		
(l) French Proprietarys.		
(m) German Proprietarys.		
(n) American Proprietarys.		

2. Give names and addresses of firms for whom you are a special agent.

3. Do you always supply in original containers as received?

4. Do you buy in bulk and pack under your own name?

5. What guarantee do you receive of the standard of purity of all imported medicines?

6. What precautions do you take on receipt, that the goods are up to standard?

## III. To be answered by dispensing chemists.

1. What precautions do you take to ensure that all drugs and chemicals used are of standard strength and purity?

2. How many qualified compounders do you employ? Do you think that the profession of Pharmacy should be restricted to duly qualified persons?

3. What is the average number of prescriptions you dispense a day?

4. What system of check do you employ in dispensing?

5. What difficulties do you experience from the Poisons Regulations?

## IV. General.

### To be answered by all.

1. Do you consider that control of therapeutic agents on the lines enacted in such countries as Great Britain, United States of America, etc., desirable in this country?

2. If not, what other suggestions have you to put forward to ensure the purity and activity of all medicinal substances manufactured or imported?

3. What is your opinion regarding standardisation of various preparations made from drugs used in the indigenous medicines, on the Indian market?

4. Are you aware of any cases where such preparations were proved to be inactive or harmful? Do you think it is possible to control them in the same way as the pharmacopoeial preparations?

5. What is your opinion regarding the increasing sale of proprietary remedies, particularly those with secret formulæ, on the Indian market? What control in your opinion should be exercised over them?

6. What personal experience have you of adulteration or inferior quality in medicinal preparations? Please give details:

(a) Pharmacopoeial preparations.

(b) Proprietary preparations.

7. Have you any other remarks to make with regard to the purity of drugs in general or any other matter in this connection?

The appointment of this Committee, we hope, marks the beginning of a new era for Medicine in India. We look forward to a day when

India will have its own pharmacopœia, based largely upon minerals and plants obtainable in this country, with standardised preparations and assay laboratories; there is no reason indeed why India should not, in the future, have a large export trade in medicinal plants, rather than be dependent almost entirely on imported chemicals. We hope that the Drugs Enquiry Committee, India, will have the fullest and most cordial co-operation of the entire medical profession throughout this country, for its appointment is the first step towards clearing up a most difficult and even dangerous situation.

## SPECIAL ARTICLE.

### IMPRESSIONS OF A TOUR THROUGH SOME WELL-KNOWN MEDICAL CENTRES IN EUROPE.

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#### ITALY.

*Naples.*—Here it is of interest to note how closely the excavated houses of Pompeii, with their square central courtyards resemble the old style of Indian house. Naples has got a School of Tropical Medicine where special study is made of malaria and other tropical ailments.

*Milan* is the main city of Italy and has 3 or 4 university clinics, medical, surgical, etc., besides a large general hospital. The medical clinic has clinical, chemical, physical and other laboratories, besides wards and special rooms for students. Near Milan is the picturesque Lake Como to which a special road for motors only—12 miles in length—has just been built.

#### AUSTRIA.

*Vienna* is one of the most beautiful and ancient towns in Europe and is situated on the river Danube below the Alps and the Carpathian mountains with beautiful surroundings and approaches.

*University of Vienna School of Medicine.*—This, the first medical clinic in the world, owes its origin to the great efforts of Von Swieten who was called from Leyden University in 1754, and to other great physicians, ophthalmologists, etc. This was the first of its kind in Europe, where all kinds of diseases are treated and great men from all countries have served on its staff. Skoda, Jaeger, Hebra, Billroth, Nothangel, Semmelweiss, Politzer, Fuchs and others developed the various clinics. Owing to these men of international reputation, medical men from all parts of the world, particularly from America, flocked to the city, and the organisation of the American Medical Association of Vienna came into existence. The main object of this Association is the systematic promotion of international post-graduate study in various branches. Students from various countries come for instruction here; post-graduate medical education and organisation is perfect in all the branches. Any study may be undertaken at any period of the year.

*Ars Medici* is the journal of the American Medical Association of Vienna, published monthly, and gives reviews and abstracts of all branches of foreign medical literature and all the latest developments. They have a good and up-to-date library. Discussions by physicians and surgeons of various clinics and special demonstrations and scientific meetings are held frequently. Pleasant social evenings are spent lasting until the late hours of the night, and ending with cheese and ham sandwiches and drinking large draughts of beer. Similar

meetings should be held in India by the way of clinical and social evenings and more professors and doctors should take part in them. We are too serious here and are more involved in money making and professional jealousies and personal aggrandisements than in the advancement of medical science.

In the handbook of the American Medical Association are described interesting courses in all branches; all are developed to the highest degree and in the minutest detail. Various clinics in Vienna stand in the name of the respective professors who are in charge and who have done original work in that subject.

A few of the leading clinics and hospitals are as follows:—

*Medicine.*—

Prof. Wenckbach's clinic (Heart), Prof. Chovostek's clinic (Heart), Prof. Ortner's clinic (Heart), and many others.

*Nervous diseases.*—

Prof. Wagner-Jauregg's clinic and Prof. Von Economo's.

*Children's diseases.*—

Prof. Von Pirquet's clinic. (Built by donations from America.)

*Ophthalmology.*—

Profs. Fuchs, Meller and Lindner clinics

*Ear, nose and throat.*—

Profs. Politzer, Hajek and Neumann clinics

*Obstetrics.*—

Profs. Peham and Kermauner clinics

*Röntgenology (X-rays).*—

Prof. Holzknecht.

*Surgery.*—

Profs. Blumm and Eiselberg.

*Dermatology.*—

Profs. Kerl and Artz.

*Physiology and Anatomical* and many others—special subjects are also taught in English.

*Prof. Wenckbach's Clinic.*—Prof. Wenckbach is an international authority on heart diseases and has done much original work to unravel the intricate problems of the working and irregularities of the heart. He was in Holland and was asked to take charge of the 1st medical clinic and professorship of medicine in the University of Vienna. The organisation of the clinic is of the highest degree; he has 4 professors under him and each professor has 4 to 6 assistants. There are about 100 beds, divided into 4 divisions, one under each professor and to each part cases of one or two systems are allotted such as cardiology, gastro-intestinal and metabolic cases and respiratory diseases and renal diseases. Each part has its own large ordinary and research laboratory, besides the general X-rays, hydrotherapy, mechanotherapy and out-patients (ambulatorium). Some of the assistants are resident. One of the professors is Prof. Saxl, who discovered Novasurol. They have a system of lecture clinics in the clinical theatres which are fitted up specially for medicine, surgery, etc. Cases are brought there and discussed in all their aspects and demonstrated and their important findings are discussed in the systematic lectures.

Besides this there are 2nd and 3rd medical clinics (Chovostek and Ortner's) organised on similar lines.

*Children's Clinic.*—The *Von Pirquet Clinic* is a children's clinic built by subscriptions from America and organised on the above lines. It is complete by itself for the investigation and study of children's diseases with its X-rays and other laboratories, special kitchen to regulate each of the children's diets on the new system (a unit instituted by Prof. Pirquet). It has also an infectious diseases ward built on a system of cubicles separated by glass partitions.

*Psychiatric Clinic.*—This is under Prof. Wagner-Jauregg, and deals with neurology and psychological studies. Malaria treatment or relapsing fever treatment is carried out here for general paralysis of the insane. Here also the professor with half a dozen assistants goes his rounds and discussions are held on

various subjects; researches are carried out and specially interesting cases are shown.

Sleepy sickness (encephalitis lethargica) was first reported by Prof. Economo, who has examined many hundreds of sections of brains and printed a large volume of study on the diseases of brain.

Also there is a general polyclinic which gives instruction in all the departments and also gives certificates; besides this, there are many assistantships and internships available for outside medical men to get thorough practical knowledge under experienced professors. Facilities for original work and research can also be had in the various laboratories under professors of international reputation. For those who know German the facilities are greater and cheaper and the universities of Berlin, Frankfurt, Munich, Heidelberg, to mention only a few, give excellent opportunities for post-graduate and higher studies. Persons knowing French also can obtain such facilities in the hospitals of Paris, especially in dermatology, venerology, bacteriology and neurology.

The system of examination is ideal and students are examined in the presence of other students according to the nature of work done by them during previous periods.

*Vienna Hospitals.*—The *Allgemeine Krankenhaus* (General Hospital) contains about 4,000 beds, and has various departments organised and fully equipped for various subjects for special study by the professors and students.

The City Hospital (Jubilans) is managed by the municipality and contains 1,000 beds. It was started 25 years ago and is still quite new and all the departments are organised and equipped on modern lines. This and other hospitals, of course, are run partly on a paying system. They are not like our Indian hospitals free for rich and poor alike. Payment is made by the employers and workers both. There is a big square in the middle round which all the buildings are erected, the most interesting being the kitchen. This is a very big place with an engine room and ice room, and the food is cooked by high pressure steam. One medical officer there was kind enough to take me to the lunch room of the residents and we had a good meal there. What do you think was the cost of the lunch there? It was about 6 annas (one Austrian shilling).

*Rudolfspital.*—Here the infectious diseases block forms part of the general hospital and scarlet fever and diphtheria cases are mostly isolated there in separate pavilions; 200 to 300 beds are reserved separately for these diseases. I saw a case of alastrim there imported from England.

*Wilheminspital.*—This has also an infectious diseases block, but the surgical work is more interesting. Surgical treatment of pulmonary tuberculosis is done under local anaesthesia (novocain) by performing phrenicotomy, apicolysis, paraffin compression, and thoracoplasty. Operative practice is done on cadavers. The assistants work very hard, they come very early in the morning at about 7 a.m. and start their private teaching work. Of course they are all paid for the instruction that they give there. Material for cadaver and research work is more than enough there. We are poorer still in this respect in spite of our having big general hospitals in large cities as post-mortems cannot be obtained owing to the prejudices of the people. The people of Vienna are prosperous as compared to us even after the war, and besides being genial and jovial in temperament they enjoy excursions, sideshows, baths, amusements, fresh air and open air exercises. They take full advantage of the benefits conferred by the State and Nature. There are besides watering places like Baden and Fuslow, and many of them are very beautiful and give all sorts of treatment like massage, ordinary and electric baths, etc. General swimming baths in Vienna have sea waves produced artificially. The river Danube also is turned in many places into open air baths.

## GERMANY.

The whole country is well organised and there are any number of factories seen everywhere, particularly along the beautiful Rhine river, manufacturing chemicals, drugs, dyes, etc.

In Berlin the main teaching and university hospital is the Charité with various clinics, surgical, medical, etc., along the lines of those in Vienna.

*Prof. Saurbach's Clinic.*—I saw here experimental research work carried on in the surgical research laboratory on a dog to test the effect of extract of kidney on blood pressure. It is a surgical clinic with a special development of the surgical treatment of tuberculosis (thoracoplasty, etc.). The medical treatment of tuberculosis is also investigated, and for tuberculosis of the skin and other types a special treatment with vitamins and salt-free diet is instituted and some cases of lupus shown to me were markedly improved by it. Such experimental work should be done in our country as we have lots of cases lying here, and special laboratories and facilities should be created.

*Virchow General Hospital.*—This hospital contains 3,000 beds, divided into separate units. Infectious diseases hospitals are not provided separately, but as in Vienna form a part of the general hospital. Prof. Friedman who is in charge of the infectious block was kind enough to show me cases of scarlet fever, diphtheria, *B. abortus* infection and others.

*Prof. Ehrman* who is the physician of the Hindustan Bureau of Berlin and advises Indian students and medical men about the hospital facilities in Berlin was kind enough to give me valuable information, and his friend Dr. Meyer accompanied me to a large tuberculosis sanatorium outside Berlin which is well organised and up-to-date. There I saw a working model of the thoracoscope and cautery to divide pleural adhesions where they impede the successful production of artificial pneumothorax.

*Bad Nauheim.*—Here the sanatorium contains a large number of experimental and electric instruments specially for cardio-vascular diseases. Murmurs and sounds of the heart are studied by radio by means of electricity. There are carbon dioxide baths from hot springs and carbon dioxide inhalation parades to inhale vapours.

*Frankfort-on-Main* has the clinic of Prof. Von Noorden whose work on metabolic diseases and especially on diabetes is well known; he has now been called to Vienna by the City Council to study special diet problems there and start a clinic.

The Hoechst Works are situated nearby. It is in their laboratories that Prof. Ehrlich first worked out and manufactured salvarsan: aspirin and other well-known products are also made here. These are one of the largest chemical and laboratory works in the world. They have a special research department and many research professors working on various infections and other problems. One of these was studying the poison of scorpions. They had collected hundreds of scorpions from Egypt, etc., and were trying to analyse the poison and preparing an antidote.

## FRANCE.

*Paris.*—Although the material is large, the post-graduate facilities are not so satisfactory in Paris as in Vienna and Germany. I saw Prof. Calmette who is in charge of the Institut Pasteur, and visited with Prof. Ramon its serum department which is situated outside Paris. I also discussed with him the improvements to be made in plague serum as the one which they make and send to Bombay is not very effective. Calmette has introduced his well-known B. C. G. vaccine from attenuated cultures of tubercle bacilli for the prevention of tuberculosis in children. The vaccine is given by the mouth. I visited the Hôpital de Pietie which is a general hospital having special departments for tuberculosis (Prof. Rist) and heart diseases (Prof. Vaguez). I also visited the American hospital at Versailles which is modern and most up-to-date.

## SWITZERLAND.

*Montreux. Lausanne. Onchy. Geneva.*—In Dr. Nihaun's rejuvenation clinic, he is of opinion that monkey glands are not necessary, but arrangements can be made with slaughter-houses and the fresh testis of any animal may be grafted in the sheath of the rectus muscle under local anaesthesia. There is no need to go to monkeys and he believes in a combination of both the methods of Steinach and Voronoff.

*Dr. Rollier's Clinic* for the heliotherapy treatment of tuberculosis is at Leydin. There are about 50 sanatoria in Switzerland where medical treatment of tuberculosis of the lungs with pneumothorax, oleothorax, etc., is carried out. Operations are not done even in surgical tuberculosis of glands, joints and the spine, and conservative medical treatment is recommended with exposure to the sun and quiet graduated work such as making baskets and small parts of watches.

Tuberculosis of joints, glands, the spine, etc., all have special sun treatment; all are diagnosed and examined frequently by X-rays. The results are very satisfactory in the majority of cases. There are also fine private nursing homes such as those at Valmont and Monrian near Montreux for carrying out various treatments, fitted up with X-rays hydrotherapy, massage, etc. Nearby, Evian and other watering places are nice and beautiful, and besides saline drinks there are entertainments and bathing facilities with massage and hydrotherapy.

*Berne*, the capital city of Switzerland, is a fine place. It has a sero-therapy institute, which prepares vaccines and sera on a large scale. They have no plague there, but plague serum is prepared, while in India although we have got hundreds of such cases no sera are prepared. It is reported to be more effective than others and so I asked the Director to send me some for trial in our cases and as he was kind enough to do so we are trying it now with good results.

## ENGLAND.

I attended at Manchester the 97th Annual Meeting of the British Medical Association. The programme was very interesting. The scientific and clinical business of the meeting was organised in various sections. There were discussions and reading of papers, demonstrations and special addresses.

In the surgical section one had the pleasure of hearing the Mayo brothers, the founders of the famous Mayo clinic, on the mechanism of production of pain, and also Sir Farquar Buzzard, Regius Professor of Medicine at Oxford, who had the frankness some time ago to tell the medical profession in England that it was both ignorant and arrogant. We have to take a hint here too about the similar state of affairs in India.

Prof. Pottenger from America introduced the discussion on tuberculosis of the lungs, putting forth the view that tuberculous infection begins not at the apex, but is sub-apical. Besides this, there was the medical exhibition. Merchants and chemists had stalls for advertising their products and used to give away eatables free, beginning from cocoa, chocolates and biscuits to Sister Laura's food for babies.

A visit to the Tottle cotton mills and its school for workers and also the sports club for millhands was very instructive.

*London.*—The London Hospital, which is the largest hospital with 1,000 beds, now has a new clinical theatre and lecture arrangements. Demonstrations and lectures are given with the cases on various subjects as in the continental clinics.

The Cardiac Department was started under Sir James Mackenzie. All other departments are completely equipped and it is a good place for education, but restricted for foreign students who only constitute 2 per cent. of the total. The diabetic ward is under Dr. Leyton and all the details of insulin treatment are worked out. He said that if insulin can be made from goats someone will make a fortune in India. Here they have also a medical unit concentrating on teaching and research as on the continent, besides the honorary medical staff doing usual routine work.

Radium Department. Here emanation gas is collected in thin glass tubes (known as radons or seeds) and these are inserted in growths. The Brompton Hospital for Diseases of the Chest is worth visiting; here one can see in the morning a series of cases of artificial pneumothorax and their X-ray plates in the afternoon.

*Heart Hospital.*—Electrocardiographs are taken by a technician and orthodiagraphy is also done.

Infectious Diseases Hospital of the Metropolitan Asylum Board.

*Smallpox Hospital.*—Mild types of smallpox are seen generally and they are in an isolation hospital far away and all cases are rigidly isolated. All precautionary measures are taken, even for contacts, who are watched. The state of things in our country is not satisfactory as even though there are hundreds of cases of smallpox in Bombay and other towns they remain unnoticed, let alone isolation, and most of them remain without treatment.

The Tropical Diseases Hospital and New London School of Hygiene and Tropical Medicine are very interesting and have all the various departments fully organised and fully equipped on modern lines.

### Conclusions.

From the impressions of my tour through some of the important medical centres in Europe, I should like to say that we have yet to learn much from the European countries and have to remember that more work of a practical kind is carried out there in the college life.

Students there pay more attention to sports and outdoor life and develop their physical powers in order that they can do better mental and sustained work. They have not to attend so many lectures and do so much reading as is done here, and do not have to go through the grinding of our bad system of examinations.

Before entering into practice every medical man tries to do practical and some special research work. Of course, they have special facilities and also an agreeable climate for research work. Some receive payment (from Rs. 100 to 150 per mensem) while others do voluntary work.

Professors are paid less than here (not more than Rs. 1,000 per mensem to the highest post), but in addition clinical whole-time professors are allowed some consulting practice in their own clinic and I saw some well-known clinics in Berlin and Vienna with fine consulting rooms with secretaries, assistants, etc., helping not only in the routine clinic and research, but also in consultations and investigations.

They have a system of paying patients in practically all the hospitals and every patient contributes his mite according to his means. Also his employers pay something. This amounts to a large sum, sometimes more than half the cost of running of the institution. and then the staff and workers are better paid and the hospitals are better equipped with all the latest improvements and research facilities. We ought to introduce such a system in our hospitals too.

University clinics should be started in each subject, medicine, surgery, obstetrics, etc., by the universities in India and put in charge of competent professors who should organise not only teaching in that subject, but also research work.

portion of the face and the brain, i.e., by rendering it anæsthetic. This may be done by the injection of alcohol into the corresponding nerve trunk, preferably at its point of exit from the skull. The anæsthesia resulting lasts for a number of months and gives pain relief lasting on an average for from one to three years. Injections may be repeated as needed, but the duration of relief decreases after each repetition until they finally cease to control the pain. When this occurs it becomes necessary to either inject the ganglion itself or to resect the sensory root. The operation is much more satisfactory and many times safer than the blind introduction of a needle inside the skull. Also division of the root which is the nerve connection between the ganglion and the brain is the only method by which regeneration can be prevented. All operations on the peripheral branches of the ganglion nerves are unsatisfactory as regeneration will occur. In fact alcoholic injections give more enduring relief than peripheral evulsions.

The Gasserian operation gives very satisfactory results and the mortality rate in numerous clinics is well below 2 per cent. The entire root was formerly severed with complete anæsthesia of the side of the face including the eye, thus leaving the patient in constant danger of injury to the cornea with ulceration. It has recently been found that the part of the root supplying sensation to the eye can be preserved without interfering with the relief of pain, preventing corneal ulceration. It is also possible to preserve the motor root which lies directly behind the sensory root and supplies the muscles of mastication on that side.

*Glossopharyngeal neuralgia.*—This is a very rare type of neuralgia which follows the distribution of the glossopharyngeus nerve, the pain running between the back of the throat and the tragus of the ear. It is otherwise similar to trigeminal neuralgia excepting that it is more prone to long remissions and it is even more violent during an attack. The best treatment is division of the nerve within the cranium, reaching it through the posterior fossa.

*Pain in malignancy.*—Malignancy especially when it involves bone may produce severe pain requiring large doses of morphine. A great deal can be done to relieve these distressing conditions by dividing the sensory nerve supply to the part invaded. If the pain is in the face or mouth alcoholic injection of the branches of the fifth nerve or resection of the sensory root will relieve it. If it is in the neck, shoulder, or arm intradural resection of three or more posterior roots supplying the area will interrupt the painful stimuli. It is necessary to cut at least three roots to render any area anæsthetic because of the overlap of the fibres. For pain below the thorax the operation of chordotomy is of value. This consists in cutting the antero-lateral columns of the spinal cord above the painful area. The fibres carrying pain and temperature sense to the opposite side of the body are located in this tract and their division removes these sensations from the contralateral side without disturbing touch or motion. In certain instances it is possible to control painful lesions by injecting or cutting the peripheral nerves supplying the affected part.

*Blepharospasm.*—Spasmodic twitching of one or both sides of the face is not infrequent and is usually of functional origin or due to some irritation of a chronic nature. As such it is only of slight annoyance to the patient. However if the spasm becomes so great as to firmly close one or both eyes at the slightest excitement it interferes with his daily life markedly. Such cases are seen and the ever-recurring spasm so over-develops the orbicularis oculi muscles that the eye cannot be forced open without excessive traction. The injection of alcohol into or the surgical division of the branches of the facial nerve going to the orbicularis oculi muscles will enable the eyes to be opened at will. This will not prevent spasm of the lids, but it is observed that when the total mass of muscle which goes into spasm is reduced by paralyzing part of it as above the intensity and frequency of the spasm is decreased. Further the drooping lower lid found in the usual facial paralysis

## Current Topics.

### Some Neurosurgical Problems other than Tumours and Abscesses.

By H. W. WILLIAMS, M.D., F.A.C.S.

(Abstracted from *New York State Journal of Medicine*, Vol. XXX, No. 11, June 1st, 1930, p. 631.)

*Trigeminal neuralgia.*—The treatment consists in interrupting the nerve connection between the sensitive

is not observed because the innervation of the muscles of the upper lip is preserved, holding the lower lid in its approximate normal position.

**Cerebral lues.**—Choked disc with headache and high intra-cranial pressure is a not uncommon occurrence in cerebral syphilis. There is great danger of this producing optic atrophy before anti-luetic treatment can sufficiently lower the pressure. The artificial lowering of intra-cranial pressure by sub-temporal decompression will do a great deal to prevent this accident. In the crises of tabes root resection or chordotomy may be of great value.

**Sympathetic nervous system.**—Within the past three or four years the sympathetic nervous system has come to be of surgical importance. Sympathectomy was first undertaken for the relief of spastic paralysis, but the results have not proved satisfactory in this condition. It has however been found to be of marked benefit in painful arterial spasm such as is present in Raynaud's disease and angina pectoris. In Raynaud's disease removal of the lumbar and sympathetic chains markedly improves the circulation of the corresponding extremity and prevents the painful symptoms of the disease. In angina surgical removal or more safely and preferably alcoholic injection of the left cervical chain in a large percentage of cases favourably modifies the attacks. It is necessary to destroy not only the cervical ganglia but also the first and second thoracic ganglia in order to interrupt all the necessary rami.

### Ethyl Petrol.

(Abstracted from *The Medical Officer*, Vol. XLIII, No. 25, June 21st, 1930, p. 277.)

THE Ministry of Health has investigated the possible influence of the use of ethyl petrol in motors upon the health of the community, and has discharged the defendant without a stain upon her character. The final report of the Departmental Committee is now published (H. M. Stationery Office. Price, 1s. net), and is rather a remarkable piece of applied physiological research, which has a value for many to whom the merits and drawbacks of ethyl are of no interest. The investigation was costly and, now that its conclusions have been published, seems on the superficial view to have been unnecessary. But this is far from being the case, for there was a *prima facie* case against ethyl which could not be allowed to drift unheard, and the inquiry was demanded alike by the medical profession and by the public. We have the verdict and it is in accordance with the evidence. But the evidence is more interesting than the verdict, for it throws light upon chronic lead poisoning and the physiology of the ingestion and excretion of substances not utilised by the body economy.

Ethyl petrol applied to the skin appears to be innocuous. The Manchester Cancer Committee has proved that the volatile hydrocarbons have no cancer-producing properties and paraffin dermatitis is not caused by light oils. The additional fact that lead tetra-ethyl is also harmless to the skin is of decided interest, for it is another step towards our understanding of "irritation" in its somatic meaning.

The fact that civilized man normally inhales a certain amount of lead and excretes it in his urine is of importance. Chronic nephritis is one of the best known risks of lead poisoning, and it is worth considering whether the continuous excretion of lead in minute quantities renders the kidneys liable to damage. There is some evidence that chronic Bright's disease is more frequent in city than in rural districts, and the age incidence is somewhat earlier in the former than in the latter. Possibly lead excretion may be one of the causes of this. However this may be, the slight extra lead intake and excretion which might occur should ethyl petrol become a popular fuel appears to be negligible. The dust of streets contains from 0 to 3.3 per cent. of lead, so the extra lead which might be added by exhaust fumes from cars burning ethyl petrol would not materially upset this remarkable diversity.

Indeed the dust from garages where ethyl petrol is used contains much less lead than the dust from many London streets.

Nor does the inhalation of fumes from ethyl petrol appear to have any special danger. Experiments carried out on policemen controlling extensive traffic blocks are valuable, not only in exonerating ethyl petrol, but all fumes given out by exhausts. London on a hot day may be offensive to the olfactory apparatus, but it does not appear to do damage to respiration and excretion. When ethyl petrol is spilt in a confined space, the supernatant air was found to contain 19.3 milligrams Pb. per cubic metre. The lethal concentration for mice was 3,280 milligrams per cubic metre, so the use of ethyl does not add to the dangers of asphyxia in garages. The only "recommendation" of the committee is that "garages should be efficiently ventilated and that spillage of ethyl petrol should be avoided." It needed no special inquiry to tell us that, but it did need one to guarantee that this is all that is necessary.

### Spontaneous Rupture of the Heart and Hæmorrhage into the Pancreas.

By J. N. W. LOUBSER, Staats Examen (Germany), M.D., ch.D. (Berlin), Bethel, O.F.S.

(Abstracted from *The Journal of the Medical Association of South Africa*, Vol. IV, No. 11, June 14th, 1930, p. 325.)

WHAT makes the case of special interest is the fact that it was accompanied by an extensive hæmorrhage in the pancreas. The history immediately preceding death is briefly as follows:—

About 10-30 p.m. on Sunday, 9th March, 1930—after the usual week-end beer drink—two Basuto males had a friendly fencing bout with knobkerries and shields. Suddenly one complained of feeling faint, sank to the ground, and died shortly afterwards. At 8-30 a.m. the next day I held a post-mortem examination. The body, that of a Basuto male aged about 30 years, was well nourished, and very powerfully built. Except for two thin parallel purple stripes below the left nipple, and about three inches long, there were no external signs of violence. On incision the stripes proved to be due to slight bruises, merely skin-deep. The fatty and muscular tissues underneath showed no bruising or discoloration, nor were any other bruises of the thoracic or abdominal walls found. The lower lobe of the right lung was adherent to the lateral thoracic wall and the diaphragm. Both lungs were strongly congested. The pericardial sac was distended *ad maximum*, and contained about half pint of dark, semi-congealed blood. The heart was firmly contracted, of normal size, and entirely empty. At the apex was an irregular-edged tear, about one inch long, and communicating with the left ventricle. The tissue in the vicinity of the tear was of a pale yellowish colour, and felt less elastic than the rest of the heart muscle. The posterior cusp of the tricuspid valve was slightly shrunk. Both coronary arteries readily admitted the passage of a probe along their entire length, and appeared normal when opened. The aorta exhibited no signs of disease; the wall was soft and elastic, the intima smooth and shiny. The stomach contained at least two pints of Kaffir beer, otherwise it was normal, as were all the organs of the body except the pancreas, which had a diffuse hæmorrhage along its entire length.

### The Healing of Ulcers.

By R. WALKINGSHAW, M.C., M.B., ch.B., D.T.M. (Abstracted from *The Malayan Medical Journal*, Vol. V, No. 2, June, 1930, p. 65.)

ON admission all the patients are subjected to a full routine physical examination and any infection found is treated, the most common being syphilis and ankylostomiasis and in addition, since most of the patients are in poor general condition, an effort is made to improve that.



To clean the original ulcer most success has been obtained from the following routine:—

(1) Clean off gross dirt, free pus, sloughs, etc., with saline swabs—the douche can and nozzle method is unsatisfactory owing to the adherent nature of the discharge.

(2) Immerse the leg in hot saline baths twice a day. These baths are restricted to 10 minutes each since, if a longer time is allowed, the dressers tend to leave the limb in the bath for a much longer period—without, of course, adding more hot water to maintain the temperature—and it has been found that prolonged immersion in cold solution is definitely detrimental. (Sometimes they have been left for 1½ to 2 hours while other work is receiving attention.)

(3) Clean the ulcer with hydrogen peroxide after the baths.

(4) Apply hot saline foment 4-hourly.

(5) Substitute a cold compress of 1/60 carbolic lotion for one of the middle day fomentations.

With this routine the ulcer is usually clean in 5 to 7 days depending on its area and depth, but it shows no tendency to healing around the edges which are usually raised.

To bring the central depressed area up to the level of the surroundings by means of granulations Acriflavine has been found of most use, the central depression being filled loosely with gauze moistened with a 1/2000 solution and a plain 4-hourly fomentation is placed on top; the flavine gauze is renewed twice a day and the cavity or central depression is kept clean by hydrogen peroxide, but as soon as possible this dressing is stopped to avoid the risk of the ulcer breaking down again and the next stage is proceeded with.

At the earliest opportunity a dressing of normal horse serum is carried out by applying a double layer of gauze cut more or less to the shape of the ulcer but extending ½ to 1 inch beyond the margin and the serum is dropped on to this by means of a 1 c.c. syringe so as to moisten the whole area of gauze, 1 c.c. of serum will cover about 8 sq. in. when applied drop by drop and then the whole area is dabbed firmly all over with a tiny gauze swab so as to obtain close apposition between the serum and gauze and the surface of the ulcer. It is then left for a few minutes to become tacky and then a protective dressing of a few layers of sterile gauze and a single layer of wool is superimposed and a firm bandage applied. The bandage must be firmly applied otherwise a sacculated collection of sero-pus may form over the central area of the ulcer. The dressing is left undisturbed for 4 to 6 days.

For removal the dressing is moistened with saline and the gauze stripped off so as to cause as little damage as possible to the skin edge and after cleansing with hydrogen peroxide and saline and drying carefully, serum is again applied and left for another 4 to 6 days and so on.

The type of serum used is of no importance and satisfactory results have been obtained with anti-tetanic serum, with some anti-diphtheritic serum which was so old that it was retrieved from a box of old drugs set aside for condemnation in a medical store, and at present normal horse serum is being used as it is the cheapest.

Most other ulcers that have been subjected to this scheme have healed equally well and much more rapidly than by means of the usual ordinary medicated gauze dressings—the only difference being that they seldom require the baths and carbolic phase as they are sufficiently clean and healthy to proceed with flavine and fomentations to bring the surface up to the level.

The advantages of this serum dressing are that the granulated area remains healthy, it does not heap up into exuberant masses and the dressing requires renewing only once in 4 to 6 days. Patients usually think that on this account they are being neglected, but I have found that if the dressing is done either by myself or by one of the Assistant Surgeons and the patient is told at the time that he must not undo the bandage till the doctor himself comes to undo it they

are amenable to reason, and when they see the ulcer remaining clean and healthy after the first week there is usually no further trouble.

## Uroselectan: A Preliminary Experimental Note.

By W. W. GALBRAITH, M.B., Ch.B.,  
and

W. A. MACKEY, M.B., Ch.B.

(Abstracted from *The British Journal of Urology*,  
Vol. II, No. 2, June 1930, p. 122.)

PYELOGRAPHY by the methods hitherto in vogue entails the passage of a cystoscope and ureteral catheter. In certain cases, which need not be specified, the passage of either of these instruments may be difficult, or even impossible. In practically every case, discomfort, often actual pain, is caused. For these reasons many attempts have been made to produce a radio-opaque substance, which, administered without instrumentation, would be excreted in sufficient concentration to yield satisfactory urograms. The obvious ideal is a substance which can be administered orally in palatable and innocuous form. This ideal is not yet achieved, but recent work on these lines is likely to prove a notable advance.

The investigations of Professor Binz and Professor Râth, of Berlin, have produced a substance with the formula:

2-oxy. 5 iodopyridine-N-acetic acid-sodium.

Containing 42 per cent. of iodine by weight, it is possessed of a high degree of radio-opacity. It is manufactured commercially under the name of Uroselectan. The original clinical investigations were carried out by von Lichtenberg and Swick (1929). This drug, injected in solution intravenously, is rapidly excreted almost in its entirety by the kidneys. X-ray films taken during excretion of the drug give a satisfactory visualisation of the urinary tract. It seemed possible that when a complex substance of this nature is excreted in high concentration by the kidneys, its passage might cause damage, even though of slight degree and transitory, to the kidney substance. The patient requiring urographic investigation frequently suffers from an already decreased renal efficiency. The administration of uroselectan to such a patient might aggravate an already existing pathological lesion. Various writers (Swick, 1929; Vallery-Radot, Dalsace, Nemours Auguste et Derot, 1930) state that uroselectan is relatively non-toxic to lower animals, but satisfactory details of their experiments are not available in the literature. We decided, therefore, to investigate the effect on animals of various doses of the drug, before freely adopting the method for clinical use in the human subject.

### Technique.

In assessing ill-effects of the drug, three criteria have been utilised, viz., the general bearing of the animals; examination of the urine; histological examination of the kidneys. Attempts were also made to obtain urograms in the treated animals. Young rabbits of 2 kilograms weight, free from obvious disease, were used, but it must be noted that apparently healthy rabbits frequently show traces of albuminuria owing to the high incidence of spontaneous renal lesions (Mallory and Parker, 1927). The uroselectan was made up in doubly-distilled water in 40 per cent. solution. This was twice filtered and finally sterilised by immersion for twenty minutes in a water bath at a temperature of 100°C. The resulting product was a clear amber liquid. The solution was freshly prepared for each experiment. Varying volumes of the solution representing graduated doses of the drug were administered by slow injection into the posterior marginal ear vein of the animals. The doses employed were 1.34 gm., 4 gm., 6.6 gm. and 10 gm.; these represent the human dose per kilo and 3.5 and 7.5 times this dose, respectively. The X-ray photographs were taken before the injection, and at



frequent intervals thereafter, particularly during the first hour. Specimens of urine were obtained by catheter at intervals varying from five hours to forty days after the injection, and were examined chemically and microscopically. In all the animals except one a left nephrectomy was performed, under ether anaesthesia, twenty-four hours after the injection. The animals were killed with coal gas after an interval varying from twelve to forty days, and the second kidney then removed. Immediately after removal the kidneys were cut into small pieces for histological study and portions were fixed in Zenker's fluid to which 10 per cent. of formalin had been added, and in 10 per cent. formalin in normal saline. An attempt was made to produce an artificial hydronephrosis in one animal. Through a loin incision the ureter was exposed and fixed in a kinked position to the deep suture line. This rabbit on two occasions thereafter received a dose of 4 gm. of uroselectan.

### Results.

(1) *General condition.*—In no case did the general bearing of the animals indicate any ill-effects of the treatment sustained. The injection appeared to be painless and the animals were as alert and lively as normal.

(2) *Urinary findings.*—With regard to the examination of the urine, an important fallacy was noted in the early specimens. Uroselectan, in dilute solution in water or in urine, yields, with salicyl-sulphonic acid, a white finely crystalline precipitate; with Esbach's reagent, a yellow cloud subsequently resolving into bundles of acicular crystals; with nitric acid, a white ring soluble on shaking with excess of acid. It appears, therefore, that in specimens of urine obtained within twenty-four hours of the administration of uroselectan only the heat test for albumen is satisfactory.

In two of the seven rabbits which received intravenous injections of uroselectan, albuminuria was observed after treatment; in one only a trace of albumen was found, in the other albuminuria was more abundant and a slight hæmaturia was present, but no casts were found. As described below, the latter animal was subsequently found to be suffering from well-marked spontaneous focal nephritis of chronic type. In spite of the degree of renal damage already present, it is noteworthy that the exhibition of uroselectan did not produce any exacerbation of the condition and the albuminuria was not more pronounced during and immediately after the excretion of the drug than during the subsequent survival period of thirty-six days. It is noteworthy that the animal receiving the largest dose at no time showed any trace of albumen.

(3) *Histological examination.*—In no case was there any significant evidence of recent damage to the glomeruli or to the tubular epithelium. The cytological detail of the cells was well preserved. Several of the animals, however, showed the presence of pre-existing chronic renal disease. In some this amounted only to a thickening of the basement membrane of Bowman's capsule and the presence in the glomerular tuft of thick reticulum or collagen fibrils, but in one animal a marked degree of chronic focal nephritis was present. This consisted in areas of cortical fibrosis with atrophy of glomeruli and tubules and the presence in related collecting tubules and ducts of Bellini of albuminous material and red blood corpuscles. As mentioned above, such lesions are not uncommon among apparently healthy laboratory animals. There was no histological evidence of any aggravation of the disease in this case, immediately, or thirty-six days after administration of uroselectan.

At autopsy of rabbit E, mentioned above, it was found that obstruction to the ureter had not been partial but complete. A condition of obstructive anuria must therefore have existed on that side. Even in the presence of this lesion two doses of 4 gm. (each dose representing three times the normal human dose per kilo) produced no appreciable ill-effects.

### X-ray Findings.

Among other factors, the small calibre of the urinary passages in the rabbit makes it difficult to secure good radiograms. The left kidney lies caudally to the ribs, while the right is situated high under the diaphragm. The left alone was visualised with any degree of clarity. Successful cases showed the renal parenchyma, the unipyramidal pelvis and the commencement of the tenuous ureter. The bladder was in all cases clearly outlined. The best results as regards the kidney were obtained soon after the injection—from three to fifteen minutes—while the bladder shadow remained clearly visible for much longer, though it disappeared in eight hours, indicating that excretion was virtually complete. In the animal in which an experimental hydronephrosis had been produced, the ureter, dilated as far as the point of obstruction, was dimly outlined. Adequate visualisation of the urinary tract was obtained after administration of 134 gm. of uroselectan, which corresponds, weight for weight, with the recommended human dose. It is of interest that doses seven times greater than the standard dose did not appreciably intensify the shadows.

## The Antitoxin Treatment of Scarlet Fever.

By J. D. ROLLESTON, M.D., M.R.C.P.

(Abstracted from *The Practitioner*, Vol. CXXV, No. 1, July 1930, p. 236.)

### Personal Experience.

It must be admitted that my first impressions were distinctly unfavourable; not only was the benefit derived from the injections not at all obvious, but the serum reactions were not infrequently very severe and sometimes caused the patient more distress than the actual attack of scarlet fever. The subsequent introduction, however, of a refined and more potent serum, which reduced the frequency and severity of serum sickness and had a much more pronounced effect on the toxic phenomena, altered my at first unfavourable opinion and convinced me of the value of the treatment. The importance of the subject, indeed, suggested that the serum treatment of scarlet fever would be suitable for a conjoint discussion with the Medical Section during my presidency of the Section of the Study of Disease in Children of the Royal Society of Medicine. The meeting was held on 25th February, 1927, when the few speakers, including Dr. E. W. Goodall who opened the discussion, and myself, who had had any personal experience of scarlatinal antitoxin, admitted that they had employed it in a comparatively small number of cases owing to the habitually mild character of the disease, but were on the whole satisfied with the results.

Although some clinicians, such as Blake and Trask, Cushing, Kolmer, and Banks and Mackenzie recommend that antitoxin should be given as a routine treatment to every definite case of scarlet fever in the early stage, my own view, which is shared by the medical staff of the other London fever hospitals, is that the antitoxin should be reserved for those cases which show any signs of severity. Owing to the habitually mild character of scarlet fever during the last few years, we have not found it necessary at the Western Hospital to use it on more than about 10 per cent. of the cases, or in 450 cases out of over 4,000 scarlet fever patients admitted since March 1926 up to the present time (April 1930).

As stated elsewhere (1929) I have been in the habit of classifying the cases into three groups according to the therapeutic effect of the antitoxin. The first group consists of 214 cases in which the benefit was immediate and dramatic, as shown by improvement of the general condition, fall of temperature to normal within 24 hours and rapid disappearance of the eruption, though as a rule the constitutional change took place some time before the rash had faded. In the second group (200 cases), numerically somewhat less than the first, the improvement, though definite, was less sudden and pronounced, while in the third group, which forms only

a small minority (36 cases) and contains a certain number of fatal cases, no obvious benefit of any kind resulted from the treatment. The serum was almost always injected intramuscularly and only in a few very severe cases intravenously.

In spite of their claim that it stops the acute process within a few hours, prevents complications and permanent damage to health, and greatly reduces the period of residence in hospital, the routine administration of antitoxin intravenously in all definite cases of scarlet fever up to the fifth or sixth day, as carried out by Banks and Mackenzie at the Leicester Isolation Hospital, does not appear to me to be justifiable, in view of the admission that the intravenous injection was accompanied by a rigor and rise of temperature in nearly 60 per cent, and in one instance by death apparently due to protein shock. Such treatment indeed can be regarded as an excellent example of the *nimia medici diligentia* which Sydenham declared was the only cause of death in scarlet fever.

The subcutaneous route, advocated by Goodall through fear of an intramuscular abscess, which did not occur in my series, was not employed. Repeated injections were required much less frequently than in the case of diphtheria, as is shown by the fact that out of 450 cases only 21 had 2 injections and 3, three injections. The doses used at the Western Hospital are usually 30 to 40 c.cm. irrespective of age, which in our series ranged from 1 to 51 years.

As already stated, the serum reactions are now less frequent and severe than they used to be. In the total series of 450 cases rashes were observed in 202 or 44.8 per cent. The eruption in every case except in one instance with a circinate erythema was urticarial, which was either localized to the site of injection, or more or less generalized. As a rule it was not accompanied by any rise of temperature or constitutional disturbance; 17 patients, however, had more or less pyrexia, and 4 pain in the joints.

In scarlet fever, as in all other diseases treated by antitoxin, it is important that the serum should be given as soon as possible, but it is a mistake to suppose that it is ineffective even several days after the onset.

It is true that the great majority, namely, 173 cases belonging to the first group, came under treatment within the first 3 days of the disease, but 67 were first injected on the fourth day, 20 on the fifth, eight on the 6th and one on the 7th, and all made a rapid and complete recovery. On the other hand, by no means all the patients belonging to my third group came under treatment late, as 14 were first injected on the 2nd, 16 on the 3rd and 9 on the 4th.

I have been very favourably impressed by the action of serum in septic cases in which a tendency to ulceration of the fauces is apparently checked by this means. There is often a remarkable improvement in the general condition even though the temperature does not fall by crisis to normal.

Like most observers, I have come to the conclusion that the chief value of the serum treatment of scarlet fever lies in its power to alleviate the toxic symptoms of the acute stage, while it has little if any action in preventing or curing complications. It is true that the incidence of complications in the present series of 450 cases was low, namely, otitis media 12 cases, two of which developed mastoid abscess, nephritis one case only, albuminuria of a few days' duration 28 cases, rheumatism 10 cases, and adenitis of convalescence 16 cases, of which 3 suppurred. In view of the fact that Burton and Balmain observed relapses in 4.16 per cent. of their 432 cases of scarlet fever treated by antitoxin, it is remarkable that only 1 of my series developed a relapse, which occurred on the 34th day. The frequency of complications, however, in scarlet fever, especially of nephritis, had so much diminished in recent years before the introduction of antitoxin, that I am unwilling to regard the new treatment as in any way responsible. Owing to the benefit accruing from the use of the serum in cases of any severity it did not seem to be justifiable to deprive patients of the advantages

of this method by the use of a control series in which it was not employed.

## Observations on the Hearts of Men engaged in Athletics.

By T. K. RICHARDS, M.D.

(Abstracted from *The Journal of the American Medical Association*, Vol. 91, No. 25, June 21st, 1930, p. 1988.)

It is not an unusual occurrence at athletic contests to see a man collapse during or at the end of a hard race. When he collapses the clinical picture is that of utter exhaustion, the patient gasping for air and yet being unable to take a full breath. He complains of abdominal pain and is more comfortable lying on his side doubled up, with both hands pressed tightly against the abdomen. The pulse is rapid and not of good quality. Although the patient is perspiring freely, his body feels cold. There is often considerable nausea and not uncommonly vomiting, and in extreme cases there may be unconsciousness.

Various reasons have been given in explanation of the cause of this collapse. Rarely it has been brought about by rupture of a heart valve. Some medical observers have attributed it to an acute cardiac dilatation. The latter condition does not seem to fit the clinical picture. Other observers have thought that a lowering of the blood sugar was a causative factor.

None of these reasons for the collapse seen in athletes during and after strenuous exertion seemed logical, so it was decided to carry out a series of 7-foot roentgen studies of the hearts of athletes when at rest and immediately after exercise. In order to take roentgenograms of a man unconscious from over-exertion, it was necessary to have him in a prone position. Therefore, to be consistent, all films were taken with the plate exactly 7 feet from the x-ray target and with the man lying flat on his chest.

These studies were carried out on all members of Harvard's varsity and freshman cross country squads, on various visiting cross country squads, and on individual distance runners of international fame during a period of four years.

The films of the men at rest were made on days when no exercise was being taken and no race or competition was imminent in order to avoid any psychologic factor causing excitement. The films after racing were taken as the men finished their races; i.e., after crossing the finish line they ran on into the x-ray room and the plates were taken before they had any time to rest.

The accompanying table shows the results of these observations. Unfortunately, all the roentgen films and the figures obtained from them except the one series presented in the table were destroyed in a recent fire. However, these figures are typical of the whole series.

From the table it will be noted that the hearts after racing were consistently smaller than those at rest. Two after racing showed no change in the transverse heart diameter, and only one man showed an increased transverse heart diameter of 0.1 cm.; but it is to be noted that this man had rested about three minutes before the film was taken. With the exception of the one instance of increased diameter, the range of decreased transverse diameter was from 0 to 1.4 cm., the average contracture for the nineteen cases being 0.67 cm.

There were also several other rather striking facts noted:—

(1) The hearts of distance runners who had had many years of competition showed the greatest decrease in the transverse diameter after racing, this decrease not infrequently being as much as 2.5 cm.

(2) The hearts of men in collapse—i.e., unconscious at the time the observation was made under the fluoroscope—showed in addition to a small contracted heart, the right border of which lay behind the sternum, a markedly diminished systolic excursion. As the man's condition improved and he regained consciousness, this excursion became greater and greater and finally at the

end of an hour or more the heart in some cases resembled one that was acutely dilated.

The author is not a trained cardiologist and so hesitates to trespass on the field of competent observers of hearts; but it did seem worth while to record these observations in the hope that trained workers in this field might more accurately check these results and offer some explanation of the clinical picture. The following is offered as a partial explanation of the conditions noted: It has been fairly definitely demonstrated that the so-called cramps of striated muscle are due to an excess of lactic acid in the affected muscle, and that the cramp can be relieved by any method that will increase the carbon dioxide content of the blood stream, thus setting free the lactic acid.

*Results of Roentgenographic Studies of the Heart After Cross Country Races.\**

Athletes.	1926. Before Race.		1926. After Race.		Difference
	T.D.	H.D.	T.D.	H.D.	
	Before Race.		After Race.		
1.....	26.5	12.4	25.2	11.7	-0.7
2.....	31.3	13.0	30.2	12.1	-0.9
3.....	29.2	12.6	29.5	11.9	-0.7
4.....	27.8	13.3	27.8	12.6	-0.7
5.....	27.5	12.9	27.5	12.5	-0.4
6.....	26.4	11.4	25.1	11.0	-0.4
7.....	24.5	12.8	27.4	11.4	-1.4
8.....	28.0	11.1	27.2	11.2	+0.1
9.....	30.3	13.7	29.7	13.0	-0.7
10.....	27.0	12.5	27.0	11.6	-0.9
11.....	30.2	14.2	30.3	13.2	-1.0
12.....	28.6	11.6	28.4	10.8	-0.8
13.....	28.4	11.6	28.5	11.6	0.0
14.....	28.8	12.6	28.7	11.2	-1.4
15.....	26.5	11.7	26.5	11.3	-0.4
16.....	31.2	11.5	30.6	11.5	0.0
17.....	29.2	12.0	29.2	11.5	-0.5
18.....	29.6	12.2	28.2	11.6	-0.6
19.....	25.8	11.9	27.6	10.5	-1.4
20.....	29.2	27.7	27.7	11.1	-0.5

\* In the table T. D. indicates thoracic diameter (transverse); H. D., heart diameter (transverse). All measurements are in centimetres.

Cannot the contracted hearts of athletes, especially those in a condition of collapse, be explained as some form of muscle cramp which results in a smaller or contracted heart, the clinical collapse accordingly being due to a cerebral anæmia, and may not this be nature's method of protecting the heart from immediate permanent harm?

### The Treatment of Tetanus.

(Abstracted from *Edinburgh Medical Journal*, Vol. XXXVII, No. 7, July 1930, p. 411.)

In 1925 Dufour recommended that antitetanic serum for the cure of tetanus should be injected into the cerebrospinal circulation while the patient was under the influence of chloroform. He held that the anæsthesia overcame the resistance of the nervous system, which up to a certain point is antagonistic to the action of the antibodies contained in the serum. A year later a case of tetanus successfully treated by this method was reported, and a few others have since been recorded. Dufour and Mourrut now report two additional cases,

both of adult males. The first of these, aged 52 years was admitted to hospital three days after the commencement of the tetanus, which had followed a wound of the hand. During two days he had received 130 c.cm. of antitetanic serum intramuscularly, but his condition was rather aggravated than in any way relieved. He was, on admission, chloroformed, and 25 c.cm. of antitetanic serum was introduced into the cerebrospinal fluid. The same evening there was great amelioration, which continued until the eighth day, when tetanic spasms recommenced. An intramuscular injection of 60 c.cm. of antitetanic serum was administered, but on the following day the spasms were more severe and the temperature had exceeded 102°F. Under chloroform anæsthesia a second 25 c.cm. of antitetanic serum was introduced into the cerebrospinal fluid, and by afternoon of the same day the painful spasms had disappeared, they did not recur and he made a satisfactory convalescence, intramuscular administration of serum being continued as a prophylactic during the first five days.

The second case was that of a male, aged 54 years, of drunken habits and the subject of acquired syphilis, who was wounded on the hand by a spicule of wood. Four days later he developed trismus, dysphagia, dysphonia, a drawn facies and contracture of the lower limbs. On the following day 40 c.cm. of antitetanic serum was administered intrathecally and 50 c.cm. intramuscularly. There was immediate improvement, but since next day, in spite of intramuscular injection of 60 c.cm. of the serum, spasms recurred, an additional 40 c.cm. were injected into the cerebrospinal fluid under chloroform anæsthesia and there was no further trouble, the man appearing completely cured two days later.

### Pyelography by Uroselectan.

By R. J. WILLAN, M.V.O., M.S., F.R.C.S.

(Abstracted from *The Practitioner*, Vol. CXXV, August, 1930, p. 296.)

THE uroselectan used was made by the firm of Schering-Kalbaum of Berlin. Great care is needed in the preparation of the solution, and it should be made up just before use. Sterile double distilled water is requisite, 40 grammes of uroselectan being dissolved in the water so that the entire solution is made up to 100 c.cm.

It was injected at body temperature, with the patient on the X-ray couch, and was injected slowly into an arm vein. A large "Record" syringe was used, and one half of the solution was first injected, and after a pause of two to three minutes the remaining half was inserted, the whole operation being completed within five minutes.

In the majority of the cases, the first radiogram was taken 15 minutes after the injection, the second 45 minutes, and a third one 90 minutes after injection. Just prior to the taking of each radiogram, the bladder must be emptied, otherwise the lower ends of the ureters are found to be obscured by the shadow in the bladder. If there is any deficiency in the renal function, the appearance of the substance in the urinary tract is undoubtedly delayed.

No complications, either immediate or remote, have arisen in any case of my series from the use of uroselectan. All were hospital in-patients (either at the Royal Victoria Infirmary, Newcastle-on-Tyne, or in a private hospital). In no instance was there any elevation of temperature or pulse rate; there was neither nausea nor any local reaction as a result of the injection. Some of my cases certainly had some deficiency of the renal function, and advanced renal disease is given as a bar to the use of the method. Fatal accidents are probably very rare, though Swick records a fatal case in a girl, aged 10, with advanced renal disease, who died within 19 hours of injection.

In addition to its diagnostic properties, uroselectan can be used as a renal function test. Normally, uroselectan begins to be excreted within a few minutes.

of injection, and by eight hours it should be all eliminated. Where the renal efficiency is disturbed, there is delay in excretion. In prostatic cases with damaged back-pressure kidneys, the complete excretion of the uroselectan is said to take up to 32 hours. Further, as already mentioned, it is claimed that almost the whole of the amount of the injected drug can be recovered chemically from the urine, though possibly an intricate laboratory test is required for its estimation.

Up to date I have employed the method in 14 cases. Eight of the series were males and six were females. The females ranged in age from 14 to 42, while in the case of the males, the youngest was 17 and the oldest 52. The clinical diagnosis of the cases was as follows:—

Urinary tuberculosis	..	7
Calculus of the urinary tract	..	3
Ectopic kidney with calculus	..	1
Torsion of the kidney	..	1
Hæmaturia of unknown origin ( ? "Essential hæmaturia")	..	1
Chronic sepsis of the urinary tract	..	1
<b>TOTAL</b>	..	<b>14</b>

In order to control the results of the uroselectan, ureter catheterization was done or attempted in 12 out of the 14 cases; in 2 cases, ureter catheterization was not employed. In 6 instances, a double pyelogram was obtained; in other 6 cases, the ureter of the pathological side could not be catheterized owing to some obstruction (4 tuberculosis, 1 ureter stone, 1 ectopic kidney).

The best results were obtained with the radiogram taken 45 minutes after administration of the uroselectan. In seven cases, uroselectan was certainly helpful in arriving at a diagnosis. In five cases there were shadows, but they were too indefinite to be helpful; while in the remaining two cases nothing whatever was seen.

In three of the cases (Case Nos. 12, 11, and 3: torsion of kidney, ectopic calculous pyonephrosis, disorganized tuberculous kidney), it did not appear to function; in two of the cases, ureter catheterization on the pathological side failed; in the remaining case, it was not attempted. These three cases are an encouragement to place a value upon the complete absence of a shadow on one side with a uroselectan pyelogram showing on the other side.

Obstruction to the onward flow of the urine, particularly ureter obstruction, would seem essential for the production of a good uroselectan pyelogram. However, that such obstruction is not necessary is proved by the Case Nos. 2 and 14, in both of which there was no hindrance to the passage of a large ureter catheter.

I doubt if uroselectan pyelography will be uniformly successful in young children, partly because of the difficulty in finding a superficial vein of adequate size, and partly because of their natural dislike to a needle puncture. Perhaps light general anaesthesia will be necessary for the administration.

Probably the most frequent cause of failure in this series was the delayed excretion of the drug from poor renal function. The importance of the possibility of delay in excretion had not been appreciated by me. In future, I propose to have preliminary renal function tests made in each case and endeavour to correlate the results in order to gauge the requisite time after injection for radiography.

It seems to me to be an essential that the fluorescent screen be used to ascertain the most favourable moment of excretion to take the pyelogram. This would reduce the cost by lessening the number of X-ray films used, but it would mean the prolonged stay of a patient on the X-ray couch—a serious encroachment on the radiographer's time and immobilization of the X-ray apparatus.

I suggest that better pyelograms might be obtainable if the recumbent patient be kept in a semi-vertical position, with the pelvis and lower extremities well raised. Gas distension of the colon is troublesome, for ordinary measures to combat this, such as multiple enemata or the administration of pituitary extract, are not practicable.

My present opinion is that pyelography from the use of uroselectan will probably never equal the results of a pyelogram made after ureter catheterization. With uroselectan, it will be unusual uniformly to obtain sufficient intrapelvic pressure to depict the earlier stages of abnormality in diseased minor calyces, e.g., in early tubercle, early malignant growth, and chronic pyelonephritis. On the other hand, there are certain cases where it is quite impossible to catheterize the ureters, and it is in these cases that uroselectan can be of such outstanding use. Such cases include urethral stricture, enlarged prostate gland, a bladder incapable of distension, renal malformations, certain cases of hæmorrhage and of ureter obstruction, bladder fistulae, also after ureter transplantation into the rectum.

### Conclusions.

My object was to weigh up the possibilities of uroselectan. It is a non-toxic substance which is a safe and helpful means of diagnosis, and its administration occasions little or no discomfort for the patient. The contra-indications for uroselectan are advanced renal or any debilitating disease. Uroselectan is also of use in an estimation of the renal function. No complications resulted from any administration. The method has come to stay for, if successful, it eliminates the discomfort of ureter catheterization. Uroselectan can provide a simultaneous bilateral pyelogram, and it can show up in cases where it is impossible to catheterize the ureters. On the other hand, it is not so reliable as the other method, where detail in the picture of the minor calyces is essential. Again, the uroselectan method is particularly useful in the routine investigation of typical attacks of abdominal pain. The interpretation of the average uroselectan pyelogram will probably be more difficult than a ureter-catheter pyelogram.

The series of 14 cases are briefly reviewed. In 7, uroselectan was helpful, in 5 cases the shadows were too indefinite to be helpful, while 2 cases were a complete failure. In the majority of the cases, a control pyelogram by ureter catheterization was made or attempted. It was particularly valuable in two cases, where the kidney was not functioning.

## Reviews.

**THE ACTION OF MUSCLES: INCLUDING MUSCLE REST AND MUSCLE RE-EDUCATION.**—By Sir Colin MacKenzie, M.D., F.R.C.S., F.R.S. (Edin.). Second edition. London: H. K. Lewis and Co., Ltd., 1930. Pp. XVI plus 288 with 100 illustrations. Price, 12s. 6d. net.

THIS book on *The Action of Muscles* deals mainly with muscle rest and muscle re-education and is therefore of most value to the surgeon, particularly the orthopaedic surgeon. Reflex actions, plastic reflexes and decerebrate rigidity are not discussed, these being concerned more with affections of the nervous system.

Discussion therefore centres round the volitional contraction of muscle, and the value of comparative anatomy in investigating the action of muscles is stressed. In suspected muscle paralysis, the author insists that there is only one true test—the *volitional test scientifically applied*, which takes into consideration not only the affected muscle but also its opponent. He shows the fallacies in the methods by which muscles are usually tested for action. A knowledge of the

action of a muscle and of the action of its opponent are equally important.

Physiologically, a muscle at rest is in a state of reflex "tone" and no slack has to be taken up before it contracts; and, secondly, the muscle cell has two properties—contraction and relaxation. A muscle therefore can be at complete rest only after death. Physiological rest however is the basic treatment of inflammation, and rest to muscle gives the greatest ultimate chance of recovery of muscle, nerve, or the cells of the central nervous system connected with the muscle—no matter which of these units is inflamed or injured. How can this rest be obtained? If both pronators and supinators of the forearm are affected, the position of rest (zero position) is when pronators and supinators are in equilibrium, i.e., with the thumb upwards. If one set of muscles is affected, that set must not be stretched and irritated by contraction of its opponent; therefore, if the supinators only are affected, the position of rest is with the hand over-supinated, to prevent the action of the opposing pronators. Faulty position of the limb will retard recovery.

The author rightly draws attention to the common fallacy that we must do something for a paralysed or injured muscle to maintain its nutrition, points out the harm that may result from indiscriminate use of massage and electricity as a matter of routine, and warns against recourse to massage and electrical treatment in acute affections of the nervous system, e.g. poliomyelitis, before the nervous system has recovered. The corneal cells are best rested by muscular rest.

Reference is made to the relationship of the thymus gland to muscular development and co-ordination, and to the advantages and disadvantages of the erect posture of man.

Exercise, the author states, should be directed towards helping the muscles on which the erect posture depends, and these muscles should have rational rest as well as exercise. Exercise such as tennis to the city man, who has had to exercise these muscles at his desk all day, may be harmful; more often rest of these muscles is indicated. The effect of faulty posture at school on the mental and physical output of children is similarly explained. Here the author seems to be on debatable ground. In the reviewer's opinion, a man in robust health should be able to maintain the erect posture for many hours without fatigue. If the erect posture muscles after 6 or 8 hours office work show fatigue, that individual's cells (muscular and nervous) are below par. Similarly the faulty position assumed by the child, and the mental dullness, may both be due to inherent weakness of these cells; and if one is dependent on the other, it is more likely that the faulty posture is the result of weak or defective nerve cells than *vice versa*, as the nerve cell shows fatigue long before the muscle cell does. We have to distinguish contractile "tone" by which muscle when it contracts is saved the necessity of taking up slack, and plastic or postural "tone" so well exhibited by the wing muscles of birds that remain in the air for hours with motionless outspread wings. Quite possibly the muscles that maintain the erect posture in man are capable of passing into this condition of plastic "tone" in which condition little metabolism occurs and no fatigue results. Is catalepsy merely a condition of atavistic plastic "tone"? A few cases of plastic "tone" (decerebrate rigidity) were observed in the Great War and it is a pity the author has not discussed this subject.

The book is stimulating and will be read with pleasure and profit by medical practitioners generally, but particularly by orthopaedic surgeons.

A. C. McG.

**SELECTED READINGS IN PATHOLOGY.** Edited by E. R. Long. London: Baillière, Tindall and Cox. MDCCLXXXIX. Pp. XII plus 567 with 70 figures in the text. Price, 31s. 6d. net.

THE history of the development of medical science should be a subject of interest to any medical man who looks upon his profession as something a little better than a means of providing himself with his

bread and butter. Many of the earliest medical books and manuscripts are museum pieces which no single individual can hope to possess, so that few of us have an opportunity of seeing them in the original, and in these days, when Latin has ceased to be the language of science, few of us would reap much benefit from such an opportunity.

Translations of the more important medical documents have been made, for example during the last year or so two or three reprints of Harvey's "De motu Cordis" have appeared, but the majority of the works of the older medical writers are out of the reach of the ordinary man. Histories of medicine and even textbooks frequently refer to the theories of these pioneers but they usually paraphrase the original teachings and seldom quote more than single sentences.

This book, which gives readings in pathology from numerous writers from Hippocrates to Virchow, a fairly comprehensive period, is therefore particularly welcome and will supply both light and serious reading, according to his mood, to any medical man. The point that struck the reviewer most was the fact that nearly all the quotations from Hippocrates to Rokitsky appear to contain about the same admixture of truth and nonsense. For example, Aurelius Cornelius Celsus's discussion on diseases of the respiratory system which reads as follows:—

"Sometimes a *humour distils from the head* into the nose, which is unimportant; sometimes into the fauces, which is worse; and sometimes even into the lungs, which is the most dangerous. When it has distilled into the nose, a thin rheum flows from it, there is a slight pain, and a sense of weight in the head, and frequent sneezings: when into the fauces, it irritates them, and produces a slight cough: when into the lungs, besides the sneezing and cough, there is headache, lassitude, thirst, heats, and bilious urine," appears to be quite as sound as Antonio Benivieni's description, written about fifteen hundred years later, of the post-mortem findings in a man who died from "Difficulty in breathing," which reads as follows:—"We decided then to open the body, so that we might apprehend the hidden and unknown causes of his illness. When this was done we found enough black bile and blacker blood had come together in his heart, so that it is no wonder that the mixture on diffusing through the veins corrupted the breath itself and brought the man to a hurried end."

Not the least important feature of the book is the excellent plates—mostly portraits of distinguished medical pioneers. The printing and paper are excellent, and the binding is artistic and suitable—it lacks the severity of the medical textbook, whilst avoiding the flippancy of the best-seller.

L. E. N.

**HUMAN PATHOLOGY: A TEXT-BOOK.**—By H. T. Karsner, M.D. With an Introduction by Simon Flexner, M.D. Second Edition. Revised. London: J. B. Lippincott Company. 1929. Pp. X plus 980 with 22 coloured illustrations and 443 black and white figures. Price, 45s. net. Obtainable from Messrs. Butterworth and Company (India), Ltd. Price, Rs. 33-12 net.

THE first edition of this book was only published three years ago and quite obviously, therefore, had a good reception. This reception was in every way deserved as the subject is dealt with clearly and concisely. In the arrangement of the chapters the author has more or less followed the usual lines. The book is divided into two parts, general pathology and systemic pathology. However, to open with a chapter on pathological pigmentation after a short general introduction is somewhat of a departure from the usual.

The subject is a huge one and in order to get it into a single volume the strictest selection has had to be exercised. There is, however, quite enough included in each subject to satisfy the needs of the student of the M.B. standard. The author is not content simply to describe the gross morbid condition and the histology



of each disease, but has included a small section on the parasitology—usually insufficient to satisfy the pathologist or helminthologist, but quite sufficient to give the student a general understanding of the etiology of the disease.

The critical reviewer usually turns to the disease with which he is most familiar, in this case the diseases common in India. Leprosy is dealt with rather summarily and the author appears to be entirely unfamiliar with recent work on the subject. Few modern leprosy workers would approve of the statement that leprosy is a fatal disease. Dysentery, on the other hand, has received more attention, there are some good photographs of dysenteric ulceration and some drawings of *Entamoeba histolytica*, the source of which is not acknowledged but which are vaguely familiar. America has her own method of spelling which, however distressing, is accepted by most of us without complaint, but has she the right to alter scientific names accepted throughout the world, in order to make them fall in with her own methods of spelling. In any case even an American protozoologist could not approve of "*entamoeba histolytica*," with a small "e" and unitalicized.

One of the best features of the book is a short bibliography at the end of each chapter. The author calls them references, but, as few of the writers are referred to specifically in the text and for others who are mentioned in the text no reference is given, the word is not very suitable.

The printing is excellent, the paper is good, there are over four hundred very clear text illustrations and about twenty useful plates. It is in the reviewer's experience the best book on pathology in the American language and we can thoroughly recommend it as a textbook for students of any grade.

**A MANUAL OF DISEASES OF THE EYE.**—By Charles H. May, M.D. and Claud Worth, F.R.C.S. (Eng.). Sixth edition. London: Baillière, Tindall and Cox. 1930. Pp. VIII plus 475 with 22 plates and 337 figures in the text. Price, 15s. net.

This is the sixth edition of this well known book on ophthalmology and that it should have reached so many editions is sufficient proof of its popularity. The book is intended for the student and general practitioner and so the common diseases are discussed in detail and the rarer conditions of interest to the ophthalmic specialist are passed over in a few lines. It consists of thirty-four chapters admirably arranged, with a large number of illustrations, many of which are in colour, making the text easy to read and understand.

The present edition has been revised and brought up to date. The chapter on the Gullstrand slit lamp and corneal microscope forms the main addition, and their clinical value is described in a simple clear way.

As the authors say it is impossible to discuss all recent work in ophthalmology and methods of treatment in a book of this size, but every effort has been made to keep the book up to modern standards.

It is a pity that in the operative treatment of entropion following trachoma which is so common in India, Webster's operation is not described. This is infinitely the best operation in most cases. Simple tenotomy is still described as a method of treatment of squint and no mention is made of reattaching the cut end of the muscle, which should be done in all cases, as otherwise the operation is not surgical. There are however few faults to be found and the book will prove most useful to all students of ophthalmology and we cordially recommend it.

E. O'G. K.

**ESSENTIALS OF CHEMISTRY: A TEXTBOOK FOR NURSES.**—By Gretchen O. Luros, B.A. London: J. B. Lippincott Company. 1929. Pp. X plus 267. Price, 10s. 6d. net. Obtainable from Messrs. Butterworth & Co. (India), Ltd., Calcutta. Price, Rs. 7-14 net.

This small volume belongs to the series of Lippincott's nursing manuals. It is meant for the training

of nurses in the general principles of chemistry and is divided into two parts. Part I deals with inorganic, organic and biochemistry and although these subjects cannot be discussed in enough detail the explanations with the examples cited are quite lucid for a beginner. The questions at the end of each chapter also help in the revision of the subject-matter. Part II serves as a laboratory manual and gives some selected experiments covering practically the whole subject-matter of the book. The book appears to be a useful addition to a hospital library.

S. G.

**DER KOKAINISMUS (THE COCAIN-HABIT).**—By Prof. Dr. Hans W. Maler, Georg Thieme, Verlag, Leipzig, 1926.

WITHIN recent times if any monograph was written which deserves the fullest attention of the medical profession irrespective of specialization, it is this one which deals with a question of paramount importance. The author who is the First Medical Officer of the clinic for Mental Disorders in Zurich (Switzerland) is thoroughly familiar with the havoc resulting from the abuse of narcotic drugs. His book, however, is not meant for the medical world alone; it is equally instructive to the pedagogue, the legislator and the judicial authorities. Indeed everyone interested in public hygiene and welfare of mankind at large should find here ample material for serious thought. The volume is a mine of valuable information and, what is more, it is written in a simple and arresting language easily understood by the average educated layman.

The reason why cocaine among all other narcotic drugs specially deserves the fullest attention, and which is repeatedly emphasized by the author, is (a) the ease with which it is applied (snuffing), (b) the peculiar aspect of the cocaine-habit which is not indulged in in isolation like the other narcotics, but spreads like a contagious disease, and (c) its disintegrating influence upon the character of the victim, paving the way to prostitution and crime. It has become known to all police departments of the world, that a criminal devoted to cocaine is far more ready to use fire-arms than the ordinary crook.

The book is divided into eight chapters. The first gives the history of the cocaine-habit, the chewing of coca-leaves, as met with by early travellers in Bolivia and Peru. Two excellent lively reports of the travellers Poeppig (1830) and Tschudi (1838) are given in detail. Tschudi especially was so enthusiastic about the beneficial results of coca-chewing among the very hardworking coolies, that he went so far as strongly to recommend this custom to the European navies for their long and fatiguing sailings.

The next chapters deal with the botany, the isolation of the alkaloid and its chemical properties (this chapter includes in detail the synthetic, non-poisonous substitutes), the physiology and pharmacology of cocaine and one on the forensic side of the whole question, giving detailed analytic tests for cocaine, its detection in the urine, in corpses, etc. Very interesting chapters on the psycho-pathological symptoms of cocaine-abuse follow.

Of special interest to the reader in India are the excellent history sheets published by Kailash Chandra Bose in Calcutta, 1902. (*Brit. Med. Journ.*, 1902, page 1021), which is the first evidence of cocaine-abuse in British India.

The book concludes with the international activities against the manufacturing of and the trade with narcotic drugs, giving a verbatim account of the Hague Convention of 1912, the respective paragraphs in the peace treaties of Versailles, St. Germain, Neuilly and Trianon, and the present activities of the committee for opium trade in the League of Nations, wherein the author has played an important part.

This is not the place to go into details: one feels inclined to translate large parts of this fascinating, but very sad, book. Let us hope that a competent



English translation will be at our disposal in a short time.

O. U.

**THE CARE OF CHILDREN IN THE TROPICS IN HEALTH AND DISEASE: A PRACTICAL GUIDE FOR MOTHERS, NURSES AND JUNIOR PRACTITIONERS OF MEDICINE.**—By E. C. Spaar, B.A., M.D., B.S. (Lond.), M.R.C.P. London: Baillière, Tindall and Cox. 1930. Pp. XIV plus 265 with 1 plate. Price, 7s. 6d. net.

THE author, as the context will show, has written this book from the point of view of life in Ceylon, that is, life in a climate with a high rainfall and moderate temperature, roughly between 70° and 90°F. The principles laid down, though in the main applicable to the tropics in general, cannot be held to be universally suitable to India with its extreme range of temperature and prevalent endemic diseases. The book is written in a clear and concise style with a freedom from technical terms which will be appreciated by mothers. Though junior practitioners will find much in this work which will be of value to them and which is not to be found in the ordinary textbook, and though there are certain chapters which they might study with advantage, we think that they should make more profound researches into the subject of pediatrics before they undertake the responsibilities of general practice.

The first part of the book is devoted to the advocacy of breast feeding, the methods and routine to be employed, the care of the mother and the digestive disorders which may overtake the nursing. The author has made his points with admirable clearness, but we cannot find grounds for the emphasis with which it is laid down, that only one breast should be employed at a time; indeed, it is improbable that the author will find many supporters of this view in this country.

The remainder of part 1 is devoted to the conduct and disorders of teething, and the care of the premature infant.

On page 44 there is evidently an error in numbers, the result of which is that it is recommended that the infant, mildly upset by teething, should be given calomel gr.  $\frac{1}{2}$  every two hours up to six doses, whereas it is supposed that formula No. 15, the more kindly rhubarb and grey powder is intended.

In Part 2 the author deals with artificial feeding. The use of humanised milk is advocated in the first two months of life, a period during which our experience of the more exacting climate of India teaches us that the fat content must be kept low, 2 per cent. or under. Though stress is not laid on the necessity for the reduction of the fat content according to the rise in temperature, Dr. Spaar suggests a simple and satisfactory method of calculating the requirements of cow's milk, which with the appropriate dilution, gives a reduced fat content. According to this formula, the caloric allotment is 41 per pound with a fat content of 2.4, an allotment suitable for hot weather of moderate degree.

Cod-liver oil is advocated as a freely administered adjuvant, indeed highly desirable, but perhaps liable in the hot weather to cause digestive derangement if given in the doses suggested, e.g., two teaspoonfuls at six months. We agree with the author's suggestion that Ostelin may be given as a substitute.

Chapters 5, part 1, 7 and 8, part 2, on the variations of stools and nutritional disorders are considered lucid and most useful. If carefully followed they should enable mothers to arrest errors of digestion in the early and amenable stages. Part 3 is devoted to the sick child, opening with general remarks on the sick room, the signs of illness and the care of sick children. Chapter 3, headed "common ailments" can hardly be termed felicitously entitled, including as it does short descriptions of such disorders as meningitis, tetanus, and peritonitis. The chapter is a model of conciseness, but we venture to think that a more useful purpose would have been served had

the author confined himself to the more truly common ailments and not compressed into 84 pages the description of as many diseases. The following statement on page 192 appears pessimistic "A weight of less than five pounds or more than eight pounds, if the infant is not prematurely born in the first case, points to some probable mental deficiency."

Taken as a whole the book, with its clarity of expression, its definite and considered instructions, will be of undoubted value to those mothers who wish to watch carefully the well-being of their infants, and are so situated that they are frequently called upon to act on their own initiative.

E. H. V. H.

**THE SOYA BEAN AND THE NEW SOYA FLOUR.**—By C. J. Ferree. Revised translation from the Dutch by C. J. Ferree and J. T. Tussaud. London: William Heinemann (Medical Books) Ltd. 1929. Illustrated. Pp. XI plus 79. Price, 6s. net.

THIS is an interesting little book drawing attention to the value of soya beans as a nutritious and cheap article of diet.

The soya bean has been one of the staple foods of China and Japan for centuries; but it has never been consumed to any extent by other nations. Hitherto it has been grown chiefly in Manchuria, whence it is exported to Europe and America.

The cost of production is low. In composition it is rich in fat and protein. In fact it resembles meat more in composition than other legumes or cereals do. Its protein resembles casein and in fact cheese is prepared from it in Japan. Further, it contains vitamins A, B and D. Its fat is also peculiar in that it includes a considerable amount of lecithin, like the fat in yolk of egg. It contains less than 1 per cent. starch; and its ash is very rich in potash and soluble phosphates. In composition the soya bean is a food of very high value.

Hitherto the soya bean has been debarred from general use because it has not been produced in a palatable and suitable form. The flour prepared from it soon turns rancid because of the large amount of fat it contains. Recently, a new soya flour has been produced by Berczeller's discovery and this new flour remains free from rancidity and is easily digested.

A new and cheap foodstuff of a very valuable nature thus becomes available for human consumption. This new flour may be used alone for making bread, biscuits, etc.; or it may be added to cereal flour to increase the latter's fat and protein contents. Soya milk is used for cooking. The protein of soya bean (vegetable casein) is used in the same way as animal milk—for food and industrial purposes.

This essay on the soya bean will be of great value to agriculturalists and to all who are interested in foodstuffs generally.

A. C. McG.

**SYNOPSIS OF MIDWIFERY AND GYNÆCOLOGY.**—By A. W. Bourne, B.A., M.B., B.Ch. (Camb.), F.R.C.S. (Eng.). Bristol: John Wright and Sons Ltd. 1929. Fourth Edition. Fully revised. Pp. VII plus 434 with numerous diagrams. Price, 15s. net.

THIS excellent cram volume has reached its fourth edition in two years and will fill a want for students and busy practitioners. It is not easy to criticise a book which has been culled from the best authorities in Great Britain and America, but in future editions—and there are bound to be future editions—we should welcome the author's own experience and views on many matters, for in such a volume it is disconcerting to find that the low Cæsarean section of De Lee is dismissed or vetoed in one line, whereas two pages are devoted to symphysiotomy and pubiotomy, operations that are nearly as dead as the Dodo and far more difficult and followed by far greater morbidity and

mortality than the lower uterine segment Cæsarean. In America, Dublin, and India this operation technique has saved thousands of lives of mothers and children which otherwise would have been lost by craniotomy, or by peritonitis if the old fashioned technique of the classical operation had been adopted. It is to be hoped that Queen Charlotte's Hospital have adopted the new operation now that the Rotunda has set an example to England. In these days of perforce small families, surely it is better to do Cæsarean section than run the risk of delivering a mutilated or injured infant at the end of a trial labour with a difficult forceps delivery. It is hoped that the author will lay stress on that curse of all obstetric hospitals and professors, namely the failed forceps case, for no mention is made of it. The report of Professor Fletcher Shaw and Hendry should be in his hands before the next edition is published. In that report he will see how often an R. O. P. is responsible for a dead mother and a dead child. Surely he will concede that Cæsarean section, preferably by the low method, would have saved two-thirds of these catastrophes. We notice that no mention is made of the interposition operation for prolapse which is performed in nearly every clinic in Europe and America in preference to the Manchester operation; an experience of hundreds of these operations makes one wonder whether this operation has been given a fair trial in England, for if results are good in India and on the continent, at least it is worthy of mention. The volume is excellently arranged and will attract a great sale. Our only criticism is that it just lacks the author's own views as a result of personal experience, when these are added it will be a gold mine of practical value to all. There is a curious printing error on page 405, line nine.

V. B. G-A.

**CHEMICAL METHODS IN CLINICAL MEDICINE.**—By G. A. Harrison, B.A., M.D., B.Ch., M.R.C.S., L.R.C.P. London: J. & A. Churchill. 1930. Pp. IX plus 534 with 2 colour plates and 63 illustrations. Price, 18s. net.

This book deals with practically all the methods of practical bio-chemistry which have application in clinical medicine. Both the qualitative and quantitative methods of analysis are described and discussed in detail, and much new material has been included not found in any one text. Unlike the large number of books on practical bio-chemistry it explains how the chemical constituents which one looks for may be formed as a result of pathological changes in different clinical conditions, making the book attractive reading. Another special feature of the book is a discussion of the clinical significance of the results obtained by analysis. These special features of the book make it useful not only to the practical chemist but also to the physician who sends the material for analysis. The book is thus an extremely useful one and the author is to be congratulated on the way he has accomplished his task.

S. G.

**MEDICAL AND D. P. H. EXAMINATION PAPERS, 1926-1929,** for the Degrees of the University of Edinburgh; the Diplomas of the Royal College of Surgeons and Royal College of Physicians, Edinburgh; and Royal Faculty of Physicians and Surgeons, Glasgow. Pp. 186. Edinburgh: E. & S. Livingstone. 1929. Price, 3s. 6d. plus postage.

There is a type of medical student, especially common in India, who makes an intensive study of previously set examination papers in the hope that he may "spot" the questions which are likely to recur in the examination for which he is up. A study of this useful little book assures us that, in Scotland at least, his chances of a correct guess cannot be put down at much over 30 per cent.

The volume covers a very wide range of examinations and subjects. We have little doubt that it will make a very wide appeal in India, not only to medical students, but even to medical examiners as well. It

is always of interest to an examiner to compare his questions and methods with those of others. The book is well printed in clear type. Of special interest to post-graduate students in India will be pp. 75-80, which give the questions set in the Edinburgh University D. T. M. & H. examination from 1927 to 1929.

**OXIDATION-REDUCTION POTENTIALS.**—By L. Michaelis. Translated from the German Manuscript by Louis B. Flexner. London: J. B. Lippincott Company. 1930. Pp. XII plus 199 with 16 illustrations. Price, 12s. 6d. net. Obtainable from Messrs. Butterworth and Co. (India), Ltd. Price, Rs. 9-6.

In the first part of the book purely physico-chemical considerations of redox potentials are lucidly and thoroughly dealt with, and in the second part their applications to physiology are systematically developed. To a student of physiology, who is not well versed in the principles of electrochemistry, this book will be of great value as the author initiates the reader first into those parts of physical chemistry, which are just necessary for a proper understanding of true reversible redox systems of importance in physiology. The reversible redox systems of organisms can be classified into two groups: (1) the negative systems, and (2) the more positive systems. The negative systems include cysteine, glutathione, sugar, echinochrome, hermidin; the more positive include hæmoglobin-oxyhæmoglobin, the physiologically unimportant system of hæmoglobin-methæmoglobin and, the very important cytochrome and Warburg's respiratory ferment. The energy-level, expressed in electric potentials of systems formed of oxygen compounds, lies on the positive side of the redox scale, and agrees with the fact that in metabolism they are reduced, whereas systems like sugar and cysteine are oxidised.

The measurement of the electric potentials of these systems gives us a far better insight into the mechanism of the reactions involved, into the best conditions for a particular reaction, and also into the number of reactants taking part in it, than has hitherto been found possible.

The book will thus be a source of inspiration to students of biology and also to other research workers in allied subjects.

S. G.

**THE PROGRESS BOOK.**—By W. M. Pilley, M.B. Pp. 142. London: Mears & Caldwell.

This is a most attractive book for parents, as it provides them with a simple means of keeping an accurate record of a child's development from birth to adult age, and of interesting events in infancy and childhood. It is divided into three parts. The first is a section devoted to "record of development," and includes spaces for a wide miscellany of events, records of height and weight, education, athletics, amusements and holidays, clubs, etc. The list of suggested books to be read is admirably compiled, Lewis Carroll, R. L. Stevenson, and J. M. Barrie being introduced quite early in the child's life. Not quite so admirable is the list of suggested boys and girls names. A self-respecting boy at school with a name like Felix or Cuthbert would have an awful time, whilst Decima and Thisbe might even fare worse.

The second part of the book is a medical history section, and this section will be of special interest to the medical profession. A well kept record from infancy to coming of age in such form would be most useful to any doctor whom the child consulted in later years. Finally there is a section for general progress, with abundant room for photographs at different ages, snap-shots, etc.

The *Progress Book* is a most happy idea, and one which will appeal both to parents and to medical men.

**PERNICIOUS ANÆMIA.**—By L. S. P. Davidson, B.A. (Camb.), M.D., F.R.C.P.E., and G. L. Gulland, C.M.G., LL.D., M.D., F.R.C.P.E. With an appendix on dietetic treatment. By Ruth Pybus. London: Henry Kimpton. 1930. Pp. XII plus 293 with 8 illustrations and 22 plates of which 12 are in colour. Price, 25s. net.

Our knowledge of the pathology and ætiology of pernicious anæmia has undergone great modification and advance in recent years, and the present volume is a summary of the vast amount of work that has been done on the subject. It includes all the important advances that have been made in our understanding of this puzzling disease, up to about the end of 1929. When a work of this nature, dealing with a special disease, is undertaken by two such authorities in their subject as the authors of the book under review one naturally expects to find an especially valuable publication, and in the present instance one's expectations are fully realised, for the book is well and clearly written in simple language, and the text is enhanced by the addition of numerous beautifully reproduced coloured plates.

An especially useful addition is an appendix of thirty-one pages by Miss Pybus, consisting of a discussion on the dietetic requirements of pernicious anæmia, followed by detailed diets and formulas for the preparation of many dishes, mainly containing liver, whereby these requirements may be met. The book is well printed in exceptionally large clear type which makes its perusal a pleasure, and in the opinion of the reviewer it will prove invaluable to any physician who wishes to keep himself abreast of modern knowledge.

**DISEASES OF WOMEN.**—By Ten Teachers. Under the direction of C. Berkeley, M.A., M.D., M.C. (Cantab.), F.R.C.P. (Lond.), F.R.C.S. (Eng.). Edited by C. Berkeley, H. R. Andrews and J. S. Fairbairn. Fourth edition. London: Edward Arnold & Co. 1930. Pp. XII plus 558. Fully illustrated. Price, 18s. net.

THIS is a book that has had a wide popularity throughout India—a popularity well deserved considering the uniform excellence thereof. The present volume has been brought up to date, and in great part rewritten, and what one likes about it, is that there is no dallying with ephemeral theory. But thereby more facts surgical or medical or pathological are stated that coincide with the fruity experience and practice of ten great teachers.

This is an achievement which always must be welcomed in India where some teachers without perhaps great clinical experience, tend to belabour students with theory and practice, little short of homœopathy in dealing with those behind the purdah.

V. B. G-A.

**THE IMPROVED PROPHYLACTIC METHOD IN THE TREATMENT OF ECLAMPSIA.**—By Prof. W. Stroganoff. Third edition, thoroughly revised and completed. 1st English edition. Edinburgh: E. & S. Livingstone. 1930. Pp. VII plus 158. Price, Rs. 7-14. Obtainable from Messrs. Butterworth & Co. (India), Ltd., Calcutta.

ECLAMPSIA—like vesico-vaginal fistula—is an index of the obstetrical civilisation of a country.

Twenty-five years ago, these cases were common in England, but now thanks to ante-natal supervision and a general rise in the quality of practitioners eclampsia is a rare disease. Professor Stroganoff bears a tribute to these facts when he states that during a stay in London—in order to demonstrate this method—only 6 cases could be found throughout the hospitals of the metropolis—whereas in the U. S. S. R. (Russia), eclampsia is an every day occurrence in all hospitals, which is perhaps what one would expect in a disrupted empire. The world and particularly India owes a debt of gratitude to Professor Stroganoff, who by perseverance and skill has been able to demonstrate that the proper treatment of eclampsia is conservative and prophylactic.

The above monograph is a monument of careful observation over 30 years, and there is hardly an authority on obstetrics who does not adhere to the principles he advocates. The mortality of cases in the Professor's hands (under 5 per cent.) is something for India to aim at, and it is to be hoped that the lesson he preaches of immediate treatment according to the plan he has laid down and which we have faithfully practised and taught at the Eden Hospital for many years, will reach in time every corner of India. For every nurse and doctor who has ever seen the treatment carried out as I have annotated it cannot be but convinced. But, as the Professor says, eclampsia, that is the prodromal symptom, is always present for those who care to read it.

As regards eclampsia India must awake, so let those who need conversion read this monograph.

V. B. G-A.

**RECENT ADVANCES IN DISEASES OF CHILDREN.**—By W. J. Pearson, D.S.O., M.C., D.M., F.R.C.P., and W. G. Wyllie, M.D., M.R.C.P. Second edition. London: J. & A. Churchill. 1930. Pp. X plus 548 with 20 plates and 34 text-figures. Price, 15s. net.

THE first edition of this book has assured for the second a warm welcome. It is a volume which should find a place on the bookshelves of all practitioners in India. Of late years the disorders of infancy and childhood have been the subject of intensive clinical and bio-chemical research, with far reaching results. The literature which has appeared is vast, so vast that the Civil Surgeon, called upon to deal with all manner of subjects, cannot hope to keep pace with it. At the same time, a working knowledge of the advances of more recent years is essential to those who are called upon to deal with sick children. In this book, modest in size, but encyclopædic in information, the authors have given us, not only the benefit of their own experience, but, as may be seen by the comprehensive bibliography, a summary of the more recent medical literature.

It is not claimed by the authors that all in the volume is new, they accept the fact that the book conforms more to the textbook type and each subject is dealt with in some detail, reviewed in the light of recent research. This naturally adds both to the interest of the book and its value as a work of reference.

The opening chapter is of absorbing interest and is an admirable summary of present-day views on the more important aspects of the physiology of early childhood. The importance of mineral salt balance is emphasised and there is some discussion on the effects of minor vitamin deficiencies. The contents of this chapter will *mutatis mutandis* have peculiar application to India and will possibly cause some to recast their views on the treatment of sick children.

The chapter on the feeding of infants will have an appeal in this country of difficult feeding. The use of acidified milks in the feeding of certain types of marasmic babies is advocated and the method described. This method has been tried and found of great value in India, and it is to be hoped that for suitable subjects it may replace the routine and often illogical use of sodium citrate. We are glad to see that dried milk foods come in for a just appreciation. Though extensively used by the public the physician is apt to regard them with some suspicion, but they play an important part in the welfare of infants in India. The following extract may be of special interest. "It is the experience of many clinicians that infants fed for long periods on dried milk are inferior in skin, muscle tone and vigour to those fed on modified raw milk. If vitamins are supplied, as should always be done, in orange juice or vegetable juice, this weakness is not displayed."

On perusing the book, it is difficult to select any chapter for special reference, the book is full of interest and one cannot but feel grateful to the authors for presenting this fund of information in such a readable and compact form.

The book has numerous illustrations, not the least useful being the reproductions of diagnostic skiagrams, with explanatory diagrams.

E. H. V. H.

**A TEXTBOOK ON THE NURSING AND DISEASES OF SICK CHILDREN. FOR NURSES AND WELFARE WORKERS.**—By Various Authors. Edited by A. Moncrieff, M.D., B.S., M.R.C.P. (Lond.). London: H. K. Lewis & Co., Ltd. 1930. Pp. XVI plus 550 with 111 illustrations. Price, 15s. net.

It is a pleasure to review this book and bring it to the notice of the nursing world of India, for I think I am correct in saying that never before has such a practical, complete and concise manual executed by experts been put upon the English market.

The general scope of the book is designed to provide the nurse entering for the final state examination with a textbook, and it conforms to the syllabus for the certificate examination of the General Council of Nursing for England and Wales.

The style is good, and the illustrations are clear, there is neither too much nor too little written, and every endeavour is made to paint a clear picture of both surgical and medical disease, so that the nurse can recognise it and treat it according to the most modern principles under medical direction.

This is the only book that a sister tutor needs in the great training centres of India for the teaching of our nurses to the standard of Great Britain, though of course in a tropical centre it is important that a sister tutor should have sufficient experience to demonstrate those diseases and conditions peculiar to the tropics and their nursing peculiarities. Perhaps in a future edition, and there are bound to be many such, the editor will see fit to enlarge its scope for European nurses in the tropics by including a section on certain common tropical diseases.

V. B. G-A.

**THE ŒDEMA OF BRIGHT'S DISEASE.**—By Ch. Achard. Translated by M. Marcus, M.B., B.S. (Lond.). London: Kegan Paul, Trench, Trubner & Co., Ltd. 1930. Pp. 231. Price, 9s. net.

The importance of chloride retention in the production of œdema is universally recognised by all the world to-day. In fact it has been so stressed as to have almost displaced every other factor and to have blinded some to the many other causes at work. It is opportune, therefore, that the great clinician to whom, more than to any other, is due the development of this theory, should have written, in full, his views on the subject. *The Œdema of Bright's Disease* by Professor Achard is published in the Anglo-French Library of Medical and Biological Science. The series of books forming this library is published with the object of bringing into closer contact the medical thought of Great Britain and France. Each volume, whether written and printed in English or French, is at once translated and published in the other country. The resultant interchange of ideas should prove of immense advantage to the medical professions of the two countries.

The present volume, so obviously the work of a master, is a joy to read. The author traces in succession the anatomy and chemistry, the clinical picture, the pathogenesis, and the treatment of the condition. The author's view of œdema is that it is a disturbance of a normal phenomenon which consists in the extravasation of a certain quantity of liquid from the blood

capillaries into the tissues and the lacunar spaces. The extravasation in the normal state is maintained within certain limits and is compensated for by the reabsorption of fluid into the venous and lymphatic capillaries. When this regulating mechanism fails, the excess of extravasation causes dropsy. After a careful survey of the clinical types of nephritis, the author devotes a chapter to the "dropsical syndrome"—and the ever varying classification of the disease. Bright himself raised (but did not answer) the pertinent question of whether the three anatomico-pathological types, described so accurately by him, were successive stages of the same process or whether they were separate diseases. The question was shelved on the introduction of a physiological classification and the substitution was satisfactory from a clinical and therapeutic point of view. In the author's opinion such a classification cannot be lasting, but it is not his object in the present work to provide alternatives. He refuses to be drawn into the question of whether œdema depends on disease of the tubules or disease of the glomeruli. He goes wider afield and asks whether the kidney lesion is the sole or even the principal cause of œdema in nephritis. He points out the similarity of the dropsical syndrome in other diseases, such as the cachectic œdemas of cancer, phthisis and starvation and even of cardiac œdema. He maintains in fact that the œdema of Bright's disease depends on conditions which are not exclusively or even mainly renal, and that certain common factors exist in the production of every œdema. Part III is devoted to pathogenesis and forms the largest section of the book. Part IV deals with treatment. The book is as stimulating a piece of medical literature as has come our way for a very long time. It teems with original thought, with accurate and clear thinking and with practical helpful advice. It is essentially a book to read and to have, and we recommend every physician to procure a copy. The translation is by Maurice Marcus and is excellent. The bibliography is extensive and complete. The publishers have produced a clearly printed and well bound volume.

J. D. S.

**THE TREATMENT OF CHILDREN'S DISEASES.**—By Prof. Dr. F. Lust. (Translation of the sixth edition by Sandor A. Levinsohn, M.D.) London: J. B. Lippincott & Co. 1930. Pp. 513. Price, 30s. net. Obtainable from Messrs. Butterworth & Co. (India), Ltd. Price, Rs. 22-8.

This book, as is stated in the preface, has been translated into English with a view to rendering it more accessible to American physicians. The author has made certain additions and notes where the methods or views described in the original text diverge from those of the American school, as for instance on the subject of the dosage of diphtheria antitoxin, on which matter English and Indian physicians will support him.

The book is of great value in internationalising the knowledge of pediatrics; in general the methods are much those practised in England and India, but there are divergencies and nowhere is the divergence more marked than in the subject of therapeutic feeding. The author presents a variety of composite feeds, including pudding-diet-Moll, butter-flour-whole-milk, butter-flour-cereal and, of course, Finkelstein-proteid-milk prepared by a new method of coagulation with calcium chloride. These foods, originally designed for atrophic infants, are recommended in those diseases, as for instance, pneumonia, when a high caloric feed of small bulk is required, but it is to be feared that, with the exception of the last, they would be unsuitable for the tropics on account of their high fat content.

Each subject is opened with a brief description of the disease. In certain subjects, as for instance, the dyspepsias of infants, with the prevalent diversity of classification and terminology such introduction is necessary, but in others the value of a compressed aid to diagnosis is doubtful and leads perhaps to an undue abbreviation of the advised subject-matter of the book.

The section on the treatment of renal disease is particularly worthy of study. Classification is based on recent lines and a differentiation is made of pedo-nephritis, that is, the focal nephritis of children. It is pointed out that this type, in spite of the presence of albumen, casts and occasional blood cells in the urine, is comparatively innocuous, and though persistent does not demand the same absolute rigidity of treatment as do the more severe types.

Three simple tests for renal efficiency are described. In the treatment of acute nephritis the traditional and empiric administration of milk diet is condemned on the grounds of the high salt, water and protein content of such a diet: salt-free diet is advocated, the water content to be regulated as far as possible by the previous day's excretion (a measure which may with advantage be followed in more chronic states), and protein is at first excluded from the diet. Sugar days, an exclusive diet of sugar for some days, to be followed by the guarded introduction of a carbohydrate-fat diet, are suggested. In chronic nephritis a more liberal diet is of course admitted, the protein being limited not by the presence of albumen in the urine, but by the non-protein nitrogen blood content. The middle section of the book is devoted to therapeutic technique and a remarkably wide range of subjects is presented, for example heliotherapy, baths, lumbar puncture and intracardial injections. Other therapeutic measures not found here are described under the appropriate subjects. It is interesting to find a distinction between tonsillotomy and tonsillectomy, hitherto we had regarded the former as a failed tonsillectomy. The author does not recommend it.

The final section, drugs and formulas, presents a comprehensive pharmacopœia to which is added a long list of proprietary preparations, many of which are of course unfamiliar, but others of which, thanks to energetic advertising, have gained a place in the formulary of many physicians in this country. Many interesting formulae for "difficult feeders" are included. There are two particularly useful features in this section, the first being that for all drugs in common use the appropriate dosage for the different ages of infancy and childhood is given, and the other that, in the case of poisonous drugs, the symptoms of overdose and the treatment of poisoning are described. Tropical diseases are not included, possibly no disadvantage as in a general textbook such subjects, when included, seldom receive but scant and uninformative attention.

E. H. V. H.

**BACTERIOLOGY APPLIED TO NURSING.**—By Jean Broadhurst, Ph.D., and Lella I. Given, R.N., M.S. London: J. B. Lippincott Company. 1930. Pp. 498, with 290 illustrations, 2 in colour. Price, £3.00. Obtainable from Messrs. Butterworth & Co. (India), Ltd. Price, Rs. 9-6.

THE importance of the functions of the trained nurse in the operation theatre and by the patient's couch can hardly be minimised. The carrying out of the doctor's instructions faithfully and intelligently are the essential features demanded of an efficient nurse. Unless a perfectly rational understanding of the measures adopted in the sick room is assured, the nurse may not be expected to fulfil this function to satisfaction. The book under review is an admirable volume attempting to explain in lucid and non-technical language modern bacteriological knowledge with a view to helping the nurse to understand her part intelligently. The book is divided into five convenient parts. The first three chapters may be treated as introductory, describing the microscope, the cell and the place of bacteria in the order of human existence. The second part—Chapters IV to VII—deals more fully with the bacteria, protozoa, etc. Chapters VIII and IX are devoted to the consideration of the rôle of bacteria as a part of our general environment. In the fourth part—Chapters X to XIII—the relationship of bacteria to diseases,

the modes of bacterial infection, the natural resistance of the organism to these onslaughts and the help... part played in the process by vaccines and sera are outlined.

The last part is devoted to a descriptive treatment of anaphylaxis and a general consideration of the many laboratory tests with their bacteriological significance.

A style free from the pedantry of unnecessary technical terms, the instructive charts and textual diagrams and the method of treatment of the subject-matter have all contributed towards the making of a unique volume on the subject and we commend the book to all those interested in the training of nurses in this country.

S. S. R.

**STATE BOARD QUESTIONS AND ANSWERS FOR NURSES.** Compiled and edited by J. A. Foote, M.D. Eighth edition. 1930. London: J. B. Lippincott Co. Pp. 600. Price, 15s. net. Available in India from Messrs. Butterworth & Co. (India), Ltd., 6, Hastings Street, P. O. Box 251, Calcutta. Rs. 11-4-0.

THIS is a most useful publication, which should be of special interest to nurses. It consists of questions and answers to them in the actual examination papers for the title of registered nurse set in 31 States in the U. S. A. The answers have been compiled from the actual answer papers sent in. The range of subjects covered is a very wide one; and includes materia medica and therapeutics, anatomy, physiology, hygiene and bacteriology, general nursing and contagious diseases, surgical nursing, gynaecological nursing, obstetrical nursing, dietetics, the ethics of nursing, chemistry and physics, psychiatric and neurological nursing; whilst a new section deals with the newer type of questions. In the present edition over 60 pages of new material have been added.

## Annual Report.

**REPORT OF THE MEDICAL RESEARCH COUNCIL FOR THE YEAR 1928-29.** LONDON: H. M. STATIONERY OFFICE. PRICE, 3s. NET. INDIAN AGENTS: MESSRS. THACKER, SPINK AND CO., CALCUTTA AND SIMLA. MESSRS. THACKER & CO., BOMBAY. MESSRS. HIGGINBOTHAMS, LTD., MADRAS AND BANGALORE.

INDIA may always take a pride in that, when the stern necessities of the Great War made an intensive study of war diseases imperative, the Privy Council in Great Britain went to India for their inspiration, and created a Medical Research Committee very much on the lines of the Indian Research Fund Association. Later, this became the Medical Research Council, and year by year the work of this Council becomes of ever increasing importance. Although its main activities centre in the National Institute for Medical Research at Hampstead, yet various research schemes and clinics at the larger Great Britain are financed by it, with contact with the Colonial Medical Research Committee. In 1928-29, with an income of £148,000, provided by Parliament, its programme for research was a very widespread one. Special investigation committees dealt with problems in human nutrition, accessory food factors, dental disease, mental disorders, tuberculin, the bacteriology of tuberculosis, the hæmolytic streptococci, vaccination, canine distemper, radiology, with special reference to cancer, X-ray standardisation, the biological actions of light, chemotherapy, salvarsan, the physiology of vision and of hearing, the properties of hæmoglobin, general bacteriology, status lymphaticus and the causes of

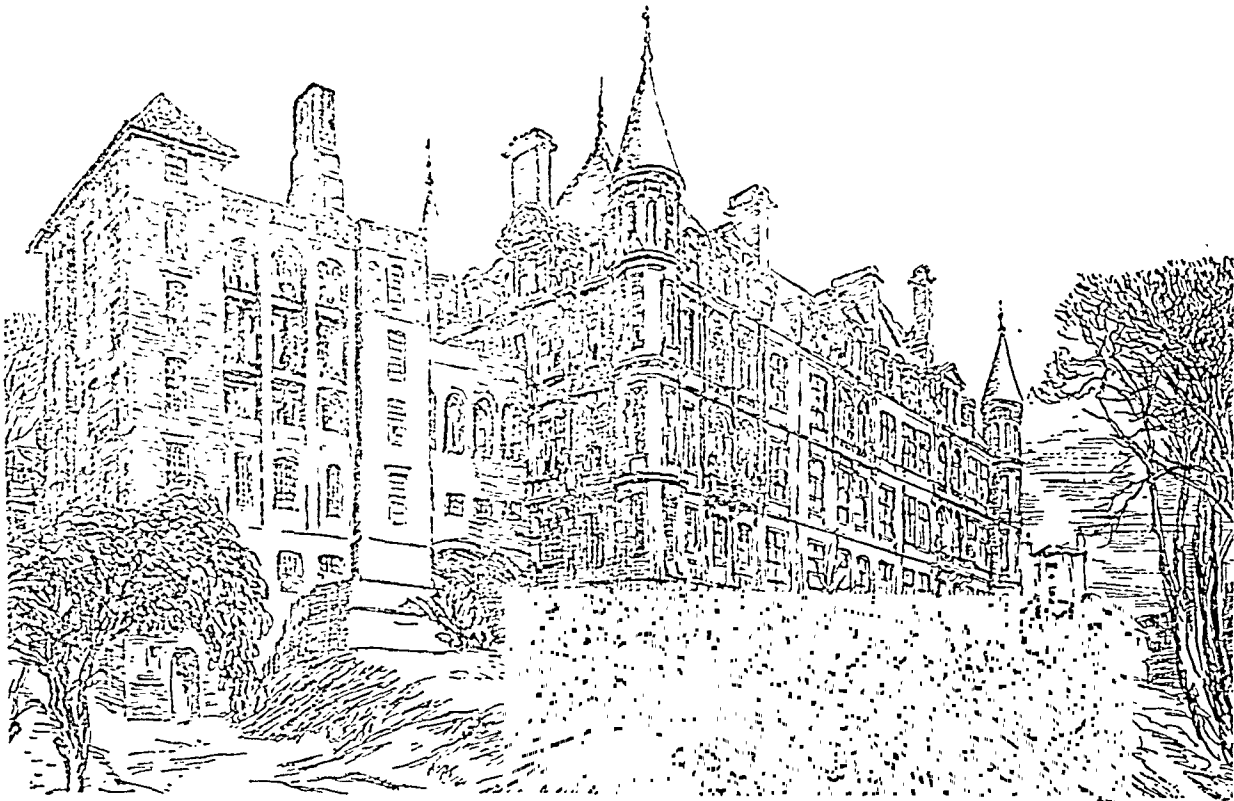


unexplained death, anaesthetics, statistics, school epidemics and miner's nystagmus. The Industrial Health Research Board had special investigation committees investigating the physiology of muscular work and industrial psychology. This list alone gives some indication of how widespread is the medical research work now organized in Great Britain; the results are of corresponding value, and of interest to every medical worker, both at Home and in the tropics.

The report for 1928-29 consists of eight main sections. Of these the five of most importance are: (i) the general covering report of the Council; (ii) the annual report of the National Institute for Medical Research; (iii) the report on biological standards and methods of biological assay and measurement; (iv) the research work of the clinical and experimental units attached to the big London and provincial hospitals; and (v) the numerous reports of the research schemes in specific subjects. We have taken the liberty of

also Lord Balfour who as Prime Minister a quarter of a century before had set up the analogous Committee of Imperial Defence. In their Annual Report two years ago the Council explained the benefits that this simple new machinery had already brought to their work, both by bringing it into more effective relation with research work of other kinds and in other places, and by aiding the difficult but important stages of passing from the completion of research work as such to its applications in practical affairs. In these, as in innumerable other ways both formal and informal, Lord Balfour promoted at every opportunity in his Ministerial office the increase of natural knowledge and its more effective use in the public service.

Lord D'Abernon, who had served for two years as Chairman of the Industrial Fatigue Research Board, of which mention will be made again on a later page, accepted the Chairmanship of the Medical Research Council as from 1st October.



The National Institute for Medical Research, Hampstead, London.  
(From the Annual Report of the Medical Research Council for 1928-29.)

abstracting very fully from the first of these, as it is of fundamental importance in the progress of medicine, and will be of special interest to our readers.

#### *Introduction.*

At the close of the year now to be reviewed, the Council had completed fifteen years from the beginning of their work. Their first quinquennium included the years of war, the second covered the years of reconstruction. At the end of each the Council attempted a review of the progress made and of the lessons to be drawn for the future. It seems fitting again that they should now look back upon the experience of five years just concluded and review the recorded events of the past year against a wider background.

To the debt the Council owe to Lord Balfour for his Chairmanship, they have to add a wider public debt which they share with many other Departments. On becoming Lord President of the Council he was entrusted with the duty of setting up the new machinery of the Committee of Civil Research, an event which takes added interest from the coincidence that it was

#### *The National Institute for Medical Research.*

The past year has seen the completion of the new extension of the National Institute at Hampstead which a bequest of the late Lord Justice Ronan enabled the Council to construct. Its completion now brings the National Institute as a whole, including the associated Farm Laboratories at Mill Hill, to a stage of development at which the Council have been aiming from the beginning, and it can now be expected to provide all the main requirements for the research work centralized here that can be foreseen for a long period of years.

It seems fitting at this stage to recapitulate briefly the story of the Institute as a whole, to which the attention of Parliament and the public has not hitherto been drawn on any given occasion, ceremonial or otherwise. It may be recalled that no capital grant has ever been made to the Council for the provision of this central Institute which constitutes an essential part of their work. The attainment of the present state of development has been reached by slow stages of growth, made necessary by the slender financial resources of the Council, of which much the greater



part has always been devoted to the promotion of work within the Universities and other research institutions elsewhere. The main Institute building, formerly a hospital, together with a nurses' home, now the Director's house, was bought with its large freehold site in 1914 for a sum that now seems trifling, derived from non-expended income in the first year of work before any awarded grants became effective. The building was lent during the war as a military hospital successively to the War Office, the Canadian Army Medical Service, and the Air Ministry. After the war, a minimum scientific equipment of the main Institute building at Hampstead, and a freehold site of nearly forty acres for the Farm Laboratories at Mill Hill, were provided out of savings accumulated during the war. In each succeeding year the equipment of the Institute and the erection of buildings at the Farm have been slowly achieved out of annual income and as largely as possible by the work of the internal staff. A bequest of the late Miss O. H. Stubber aided the addition of a permanent laboratory building at the Farm to the wooden constructions provisionally erected. The Ronan bequest brought the much-needed extension to the National Institute, and this for the first time has allowed the removal of temporary sheds erected for war purposes which for the past ten years have served some urgent purposes of scientific work.

The Council regard themselves as having had singular good fortune in their purchases of the two sites at Hampstead and Mill Hill. The whole cost to the nation of all the buildings on both sites, taking into account the contributions made by bequest, is almost certainly less than the appreciation within this decade of the bare site values of the freehold lands upon which they stand. The relatively small expenditure upon buildings has allowed the Council to provide adequately for staff and for equipment. Slowness of development has at least aided the avoidance of mistakes. The National Institute is now a worthy and effective home for the distinguished scientific work done within it by the staff. At the Farm Laboratories the mode of development will readily allow further accommodation to be provided step by step as future needs may require.

#### *Standards for biological measurement of medical substances.*

The National Institute is the centre of fundamental research work done in various branches of medical science by workers in the whole-time service of the Council, with temporary visitors from outside. It serves however another important function, very closely connected with this but additional to it. In maintaining and distributing the national standards for certain remedies, the activity of which can be measured only by biological methods, it plays a part which may be regarded as broadly analogous to that played in the physical and engineering fields by the National Physical Laboratory.

The establishment, maintenance, and application of such standards involve the work of highly qualified investigators in its several phases. There is, in the first place, the work directed to the discovery of new biological methods of measurement; and, since all measurement is comparative, this includes the devising of methods suitable, in the case of each substance, for the preparation of a permanently stable standard material, in terms of which an accepted unit of activity may be defined and which can then serve as a portable currency for the transmission of this fixed value. This work often involves original research of a high order, leading to advance of knowledge in a field much wider than that of the immediate problem. As one example of work of this kind, done for the Council at the National Institute, may be mentioned that which led to the creation and international acceptance of a stable standard for insulin, on which is based the unit of insulin now used in all countries. An additional result of this work was the introduction of one of the methods now most widely used for measuring the strength of this important remedy in relation to the standard.

At the time when work for the Council on biological standards was begun, standards for some remedies of this class, in particular for certain antitoxic sera, already existed in other countries. Action by the League of Nations Health Organization led to the international acceptance of some of these, and later to the creation of others by international agreement. In these circumstances arose an immediate national need for work upon another phase of the standards problem. National standards had to be prepared and preserved under conditions ensuring their permanence, and each had to be evaluated with the greatest obtainable accuracy in relation to the corresponding international standard. These different phases of the work—the discovery of new methods, the creation of new standards, the preparation and verification of the national standards—were in steady progress at the National Institute for some years in advance of legislative demand for them, or of opportunity for their official application. The Council, indeed, had foreseen that this country must eventually obtain by legislation an official control, like that already in force in several other countries, over the quality of a class of remedies so important and often so potentially dangerous as these. It was increasingly imperative that the practitioner should be able to administer them at need in a dosage based on accurately measured activity, and assured of their freedom from dangerous contaminations. When, therefore, the Therapeutic Substances Bill was enacted in 1925, the standard materials needed for the effective use of its machinery were ready for issue. In several instances, indeed, they had already for some time been distributed on a voluntary basis to manufacturers who had wished to apply them in advance of legislative enforcement.

The Council were accordingly prepared to accept the responsibility, legally placed upon them by the Therapeutic Substances Regulations of 1927, of preparing and preserving these standards at the National Institute. They undertook, further, to continue their investigations with a view to possible future applications of the Act to additional substances.

When the Act became effective in 1927, yet another phase of activity in this field was entailed for the Institute, with a new kind of responsibility. The standards must now be issued to all manufacturers of the scheduled substances, who are legally bound to apply them. In several instances this involves the recurrent preparation, at short intervals, of solutions of the stable standards, and the experimental verification of each of these before it is issued. Numerous official tests have to be undertaken for the Licensing Authority of samples taken by its inspectors, and periodically of all the different makes of a scheduled remedy on sale in this country. In some cases the Authority has decided, under the advice of the Council's experts, that every batch of a particular substance shall thus be tested at the Institute before issue. Such control testing, indeed, was not a completely new function for the Institute; every batch, for instance, of remedies of the arsenobenzene (salvarsan) group made in this country has been tested there since the beginning of the British manufacture in 1915, and every batch of insulin during the first year of its issue. All this has involved for the Institute, especially during the past five years, an increasing volume of work, both experimental and administrative.

Its activities in this field, moreover, have extended far beyond the limits of its legal responsibility in this country. The British standards have been supplied not only to the overseas Dominions, but also in regular supply, which the Council have been glad to authorize, to the official organizations of several foreign countries which have asked for them. Apart from informal international courtesies of this kind, the Institute has accepted a more definite obligation in relation to some of the International Standards. Experience has shown the practical convenience of placing these in a small number of national institutions. The international standards for sera have been entrusted to the Danish

State Serum Institute at Copenhagen. For several of the standard preparations of hormones and drugs, on the other hand, the National Institute here has been regarded as the appropriate centre.

These international responsibilities have entailed another burden of additional work, both in research and administration, and it seems certain that the future will see them increase. It seems likely too that a demand related to standards will arise in yet another direction. The new British Pharmacopœia, now in preparation, may require biological standards for certain remedies to which the control of the Therapeutic Substances Act has not been applied and for which its machinery may be unsuitable. The Council have already been approached as to the possibility of such additional standards being prepared and maintained at the National Institute.

The full list of the national biological standards required by the law and at present maintained at the Institute is as follows: diphtheria antitoxin, tetanus antitoxin, antidyentery serum (Shiga), tuberculin, insulin, pituitary posterior lobe, arsenobenzene (salvarsan), novarsenobenzene, and sulpharsenobenzene. All these are based on the international standards, of which those for tuberculin and insulin were, indeed, prepared at the Institute. The international standards now held there for maintenance and general distribution are those of insulin, sulpharsenobenzene, digitalis, and strophanthin (ouabain), and, in the absence of any large supply of the international standard for pituitary substance (posterior lobe), the British national standard has been widely in request from other countries. National standards for digitalis and strophanthin are ready for application when any authority shall require them.

The Council draw attention to this work in general now because of its interest and its great national and international importance, and because they think that its existence and value have not yet been at all widely understood and appreciated. As biological knowledge advances it seems certain that this branch of work will be greatly extended in its range.

#### *Studies of virus diseases.*

No part of the work directly promoted by the Council has greater biological interest at the present time, or more vital practical importance for the cure and prevention of disease, than the inquiries now being made into various diseases in animals and man caused by the so-called "viruses." The Council have on more than one previous occasion drawn attention to the new chapter in biology which is now being opened by these studies. They are concerned with an invisible world of bodies that in size stand somewhere between the largest known molecules of dead organic matter and the smallest microscopic bacteria. These cannot be seen as definite structures by ordinary microscopic means, and the relation to them of certain objects made visible by special optical methods is still a matter of discussion. They are called "filter-passing" because many of them will traverse a filter fine enough to hold back and strain off ordinary bacteria from a fluid containing them. Whether these "viruses" are organized as minute, ultra-microscopic bodies is still an open question; in any case, they are presumably too small to have an organization similar to that of such cells as have hitherto been regarded as primary units of living matter. Nobody has yet succeeded in preparing an artificial fluid which will, by itself, provide conditions in which these viruses will reproduce themselves and multiply; some of them, however, will grow in artificial conditions if a piece of surviving tissue, taken from a freshly killed animal, is added to a suitable medium. It seems to be characteristic of a virus that it can multiply only in the presence of living cells which it infects.

Undoubtedly particular varieties of virus are the usual agents of some of the most destructive diseases known to us. When the appropriate virus in minute quantity is introduced into the animal, or the plant, which it can infect, then there may occur with almost

incredible rapidity an unseen and unexplained multiplication of it throughout all the parts of the organism attacked. Proof of this is shown in that a minute portion of any of those parts will be found able to infect another similar organism, and in this will be repeated again the same swift unaccountable multiplication.

No detective story has ever offered more puzzling features than this to the curious mind. The reward for the solution of the present mysteries will certainly be immense in the new control it will bring over diseases that kill by the million, and another kind of reward will almost certainly be found in the new illumination that discovery of the laws governing the structure and behaviour of these virus bodies will give within the unknown territory between living and non-living matter. Our present almost complete impotence in face of such deadly diseases as measles, yellow fever, and encephalitis, among many others, and of such ruinous plagues among live stock as foot-and-mouth disease, swine fever, and rinderpest—and to these may be added destructive diseases affecting potato, tobacco, and banana crops—is such as to justify and indeed to demand an army of skilled workers. In this subject, however, only work of the highest technical skill is of any avail at all, and the total number of men now engaged in all the parts of this field of inquiry is very small. They can be usefully recruited only from among men intensively trained, and of these only men of exceptional ability are likely to make much progress. There is no doubt, however, that special effort ought to be made to increase the number both from the medical side and from the agricultural side, and with a view to work either at home or in the tropics.

Since the first equipment of the National Institute the Council have done their utmost to promote advance in this direction. In their view the best mode of organization was to leave to various skilled members of their staff complete freedom in selecting particular virus diseases for study. The clues that are to be sought may be picked up more easily in one part of the story than another, and it is a free search for these clues that is more likely to be fruitful than any forced diversion of effort towards those diseases that may happen to be the most killing or the most conspicuous and familiar. The progress hitherto made has been reported briefly in successive Annual Reports and of course in suitable scientific publications elsewhere. It may be useful, however, to look back now upon the past few years as a whole and to see where real advance has been made, or where it appears likely to come. To get proper perspective we must remember that the science of bacteriology in its modern form is hardly more than fifty years old. The anthrax bacillus was first isolated and described in 1876, the tubercle bacillus first discovered and described in 1882. Those now working with viruses are under difficulties very like those that confronted bacteriologists two generations ago, before they had found adequate methods of microscopic study and of artificial cultivation. That perspective view should tend to diminish any present discouragement.

Work upon virus diseases may be thought of as following two converging lines of effort. Along one line, practical devices are sought by which empirical limitations may be made of the immunity to a second attack of a virus disease that most commonly follows recovery from the first attack under natural conditions. Along the second line, investigation is made by every known method into the physical properties and natural history of the virus itself.

That first and obvious line of practical progress was opened by Jenner 130 years ago when he proved the truth of the random observation that the mild disease of cow-pox gave lasting immunity to the fatal or disfiguring disease of human small-pox. Eighty years passed before an attempt was made to imitate this example by gaining artificial immunity from other diseases by some analogous device. It was then that Pasteur made the discovery that bacterial organisms

causing chicken cholera might become so weakened or, as he said, "attenuated" by artificial cultivation that injection of them gave no disease and yet had the effect of making the animal resistant to a dose of fresh organisms that would certainly have been fatal before. He found later that the virus of canine rabies (hydrophobia) could be so modified (or "attenuated") by artificial means that it could be given harmlessly to man and bring immunity to an otherwise deadly attack by the full virus. This work of Pasteur opened the way to similar studies for a wide range of bacterial diseases and founded the science of immunology. In the past fifty years the more easily studied bacteria have had the earliest attention, and some great triumphs of preventive medicine, familiar to all, have been won by attaining artificial immunity from particular diseases by vaccination—those of plague and enteric fever for instance. It is only in more recent years that efforts have been made to imitate Jennerian vaccination for virus diseases. It has unfortunately been found that no method is yet attainable that applies uniformly to all kinds of virus, just as the successes in the field of bacterial diseases are still limited in their number.

It happens, that is to say, that the particular historical method of using cow-pox as Jenner did to immunize against small-pox in man has not so far been found applicable to other virus diseases. This instance seems in its nature to be exceptional, in spite of the incalculable value of the immediate practical results that it brought. Small-pox adapted to living in the tissues of a calf becomes cow-pox, and when transferred again to human beings, which has happened millions of times, it shows no tendency to revert to small-pox. The alteration in the character of the virus seems irreversible.

In the other viruses that have already been studied, although there may be a diminution of virulence by propagation in the bodies of animals which are not their customary hosts, this is not an irreversible change, and we cannot be certain that their former virulence will not return when they are transferred once more to the susceptible animal.

Immunologists have again and again tried to produce immunity with virus-material that has been acted upon by various chemical agents (especially those known to kill bacteria) until it is incapable of reproducing the disease when injected into a susceptible animal, and has presumably therefore been killed. The first successful use of this method was by Fermi in Italy about twenty years ago, who used a rabies (hydrophobia) virus treated with carbolic acid to immunize against that disease. In the last few years, as the Council have explained in earlier reports, a successful method of making dogs resistant to distemper has been worked out at the Farm Laboratories, Mill Hill, by Dr. Laidlaw and Mr. Dunkin, in which a virus made harmless by formalin is used for a protective injection. At the National Institute Dr. Todd has also lately shown that two or three inoculations of the virus of fowl plague which has been treated with carbolic acid and glycerin until it is no longer capable of giving the disease to a fowl, makes the bird so resistant to the disease that the subsequent injection of 300,000 times an otherwise fatal dose of infective virus leaves them unharmed. Many previous attempts to immunize fowls against fowl plague with virus treated in other ways had failed.

These two examples of protection, against dogs' distemper and fowl plague, have led to the successful use of closely similar methods in the protection of monkeys against yellow fever. It is still doubtful however whether a treated vaccine derived from "monkey" virus, although it was originally derived from human yellow fever virus, will protect men. Immunity from rinderpest, again, can be given to cattle by a treated virus, but this bovine virus is ineffective for goats or pigs. This "specificity" of viruses offers many baffling problems which are not so prominent in the field of bacterial infections. They are found in the work upon canine distemper by Dr. Laidlaw and

Mr. Dunkin just mentioned. Here it was discovered that dog distemper and ferret distemper are one and the same, in that the infection can be passed to and fro indefinitely, from dog to ferret and back. Suitably "attenuated" virus of dog will immunize dog, and that of ferret will immunize ferret, but equivalent results are not got when the ferret "vaccine" is used for dogs, or vice versa. Brilliant practical results have indeed been attained by this work in the prevention of dog distemper, as is now well known. These depend upon the device just mentioned of securing temporary immunity by "attenuated" virus which is quite harmless, and of giving during that immune period some full virus which now brings lasting immunity to distemper, without inflicting the disease itself except in shadow form.

It will be asked, if these successes can be gained, why are not all virus diseases under similar control? The public ask this as regards foot-and-mouth disease, of which the cost to the country lately has been measured in tens of millions sterling. They ask it in the medical field as regards the killing disease measles, and the plagues of influenza and of "common colds" that are believed by some to be virus diseases. As to foot-and-mouth disease, it has already been found that immunity can be given by treated virus, but inasmuch as the disease itself, unlike most virus diseases, gives no lasting immunity, this has a limited value. It could be useful for checking a wave of introduced infection, but for another troublesome fact shown by recent work, namely that at least three different types of virus exist, and the effects of one do not protect against the others. As to measles, the only animal that is affected by the virus is apparently the monkey, but it seems also that the disease cannot thereafter be passed from monkey to monkey. If influenza, as many believe, is a virus disease, progress is barred at present since it appears not to be transmissible at all to animals; and this, in view of the complete impracticability of extensive human experiments, forbids the experimental method that is essential to any measurable advance. We can only hope that means may be found to surmount difficulties of these kinds, and we have every humane inducement to persevere.

In the meantime close investigation is being made by every available method of the actual nature of the virus particles—for we know them to be particulate in the sense that they are acted on by gravity in a watery suspension. It may well be that new knowledge of their intimate nature may bring some gain in practical control of disease, and perhaps even sooner than from the studies of a more empirical kind that have just been discussed.

One line of inquiry lately pursued at the National Institute has been to examine the reactions that actually occur between the virus as such and the new substances ("immune substances" or "anti-bodies") that appear in the blood to counteract it and by which immunity is gained.

In many bacterial diseases it is known that the toxin of the invading microbe can be neutralized by the anti-toxin in the blood of the immune animal entering into some chemical combination with it. Dr. Todd, for the fowl plague virus, has shown that the virus can be made harmless by addition of the right amount of immune blood fluid. But so little is this a fixed chemical union that simple dilution with water makes the mixture again virulent. Similarly, Dr. Andrewes with vaccinia virus has shown that a neutral, i.e., non-infective, mixture of virus and immune substance can be separated out again by simple filtration, and by that means and also in other ways, the virus can be readily recovered in active form. It should be noted that some other observers, using different viruses, have found a firmer union between virus and immune substance, analogous to what is found for bacterial infections.

Another interesting line of inquiry has been that of finding the distribution of the virus in the blood—which is not a simple matter of observation, for the

invisible virus can only be traced by indirect and difficult methods. Before the war it was shown both for typhus fever and for rinderpest that the virus does not float freely like a bacterial invasion in the fluids of the blood. It is wholly contained within the bodies of the white blood corpuscles. Last year the same relation was found by Dr. Todd to be true for fowl plague and by Dr. Laidlaw and Mr. Dunkin for canine distemper; in this year Dr. Wilson Smith has found it for vaccinia. But here again we meet puzzling exceptions, for it was recently shown at the Lister Institute that in foot-and-mouth disease the virus is almost wholly and at all periods of the disease found free in the blood fluid, and this has been confirmed in the past year by Mr. Galloway in the National Institute.

There is much reason from evidence of various kinds and values to think that in general the invading virus multiplies within the cells of the living animal or plant rather than in the body fluids. It has been mentioned already that no means have been found for the cultivation and reproduction of virus outside the body in artificial imitations of body fluids. Dr. Andrewes has lately used a method of studying virus infection out of the body by infecting with virus small fragments of animal tissue which are kept "surviving" in suitable fluid media. Evidence of infection is seen in the so-called "inclusion bodies" which are found microscopically in the tissue cells, and are exactly similar to the corresponding appearances that accompany infection by the same virus in the living animal. It can be proved that in a cultivation of this kind the virus actually multiplies itself. This method has already allowed some interesting and suggestive studies of the relation between the immune substance found in the surrounding fluid and the immunity of the cells as such. The results already point to important conclusions as to wherein the immunity to some virus diseases resides. Work by this kind of method is actively proceeding and seems to hold great promise.

Methods of direct physical examination of the nature and properties of viruses are also being used. In later sections some account is given of the advances being made by Mr. Barnard towards the better optical examination of virus by using shorter wave lengths of light, outside the visible spectrum, with suitable devices to protect the virus under examination from the destructive action of the rays directed upon it and to secure photographic images. Side by side with these optical studies, efforts are being made by Mr. Elford, to improve the methods of filtration, which offer physical problems of which the difficulty comes from the scale of minuteness that is involved. His general aim is to gain better methods of separating and of measuring virus bodies of different kinds.

#### *Virus studies and cancer.*

Just five years ago the Council explained that as part of the general programme of inquiry into virus diseases which they had planned, Dr. Gye had taken up the study of the malignant growth in fowls known as the Rous sarcoma. The invisible and filterable agent of this tumour when injected into a fowl multiplies indefinitely and gives rise to a new tumour formation, and presents in that and other ways the characters of a virus. In each subsequent year the Council have given a full statement in outline of his observations and the conclusions he had drawn from them. In their Report last year they explained in some detail the manner in which he had more recently failed to obtain with certainty and regularity the results that in his earlier work had been consistent enough to lead him to a definite view of the mode in which a virus conveyed from a pre-existent malignant growth interacted with another factor in the invaded cell to produce a new tumour. In the past year Dr. Gye has made renewed efforts to find and remove the cause of discrepancies in his results, and has now, with the complete sympathy and approval of the Council, decided to leave this phase of his inquiry for the time being and to turn to other aspects of the problem.

He has been engaged in preparing for full publication the details of his prolonged and laborious work. This will serve at the least to indicate to other workers much ground that need not perhaps be traversed again.

#### *Observations upon animal individuality.*

In the course of his studies of the virus of fowl plague, of which mention has already been made, Dr. Todd has incidentally made some observations upon the red blood corpuscles of the normal fowl which have much general biological interest and seem to have a direct bearing upon the problems of the cellular "individuality" of an animal body. If red blood corpuscles of other fowls be injected suitably into the blood of a fowl A, the serum of A thereafter will make a suspension of the red blood corpuscles of other fowls gather together and sink as a precipitate, but it will do this in varying degree in respect of different individual fowls. If a number of birds be "immunized" in this way against red blood corpuscles, a mixture of the sera of all of them can be used for the identification of the blood of a single individual fowl. If the mixed serum be exposed to the blood corpuscles of a given fowl X, and they are then removed, it will subsequently retain its precipitating power for the corpuscles of any other fowl, except for those of the fowl X or its closest blood relations. It is thus shown that the red blood corpuscles of an individual fowl have some detail of character which allows them to be distinguished from those of any other individual of the same species, not being a close blood relation.

This study of "individuality" of animal cells has special interest in relation to the transplantation of skin, in skin grafting, or of other tissues in reparative surgery. It is not known whether as a general law all cells of the body, or only some of them, are stamped with "individual" as well as with "specific" characters. It is known that auto-transplants in surgery succeed where hetero-transplants, as when skin for skin grafting is taken from another person, usually fail.

#### *Studies in comparative pathology.*

So far the Council have given illustration of some of the functions and work of the National Institute for Medical Research at Hampstead. The past five years now under general review have seen a steady development of work at the Farm Laboratories, Mill Hill, which are only an extension under rural conditions of the Institute itself. The two places are separated only by fifteen minutes' journey by car. Dr. Gye's work, which has required an abundant supply of fowls under constant and healthy conditions, has been done in the Stubber Laboratory built five years ago. Work upon the virus of canine distemper by Dr. Laidlaw and Mr. Dunkin, the Superintendent of the Farm, has been conducted here with the aid of the elaborate kennels and other facilities provided by the "Field" Distemper Research Fund. The Farm has provided many essential resources for the investigation of tests for tuberculosis in dairy cattle to which the Council have drawn attention in recent reports. Here also has been worked out by Mr. Dunkin his new diagnostic test for John's disease in cattle.

At first sight it may be thought that intensive studies of disease in fowls, dogs, ferrets, and cattle should not be the concern of the Medical Research Council. But human pathology has never advanced save by the study either of tragic natural experiments among mankind or by carefully designed experiments with animals. The work with dogs and ferrets has resulted in our being able now to preserve ferrets for the future from a disease invariably fatal to them, and dogs, the chief animal friends of man, from dangerous illness. The knowledge gained in this has been of direct service already in assisting studies of yellow fever. The work upon tuberculosis and John's disease in cattle has immediate medical importance in the direct relation that both lines of inquiry have to the purity and abundance of the milk supply for the nation.

These considerations would seem to offer justification enough for these incursions by the Council into the

field of animal pathology. The Council think, moreover, that the promotion of work of this kind at Mill Hill will allow the full future development of active and intimate co-operation between their own workers and those who may hereafter be engaged in advancing the knowledge of animal disease for the good of agriculture and of veterinary medicine, to the advantage of both. The Council have endeavoured at every opportunity to assist so far as they can a policy for the more generous and consistent promotion in this country of the study of diseases of live stock. It is not within their duty to point to the manifest need for more abundant work on these subjects throughout the Empire or to a state of affairs in which the chief Veterinary College within Great Britain, which should be the first home of this kind of research work, is at present literally falling into ruin. The nature of their own work inevitably brings knowledge of these circumstances vividly before them. But they have the clear duty of pointing again, as they have done on former occasions, to the great benefits that must come to their own work from the better central organization of research work into animal disease and the better material provision for it. Medicine has always gained by the study of animal disease, and yet it should not fall unduly to medical interests to study animal disease for the benefit of the animals themselves. The medical and veterinary interests should be developed side by side together in an active partnership, each giving and receiving benefits springing from cordial co-operation.

A significant illustration of the simplicity and value of co-operation of this kind may be found in the work by Dr. Stanley Griffith, who has studied the bacteriology of tuberculosis for fifteen years in the Council's whole-time service at the Field Laboratories, Cambridge, and Professor Buxton, Director of the Department of Comparative Pathology, founded years ago at the same place. At these Field Laboratories also the Council have just erected a Dietary and Nutritional Laboratory. Special attention will be given here to the part played by nutrition in modifying the resistance of the body to infective disease, animal and human, and active co-operation has already been shown between workers in this Laboratory and those in Professor Buxton's Department next door to it.

#### *Clinical research and experimental medicine*

In these introductory remarks the Council have spoken of work under the direction of their own staff at the National Institute, whether at Hampstead or Mill Hill. The main body of the present Report will make it quite clear that this is only a part of the work they are able to support in general from the funds entrusted to them by Parliament, or received from other sources. Much the larger part of their annual income is expended in grants to approved workers in almost all the Universities and at other centres of research throughout the country. It will probably strike any reader of the detailed summary of the year's work given in the present Report, or in any of its predecessors, that most of the research work supported is conducted in the laboratories of physiology, biochemistry, bacteriology, pathology, and the like, and that on the whole a very small part of it has been done by men engaged in clinical work and studying disease as it actually presents itself in human beings. This suggests some considerations of great importance which the Council reviewed ten years and again five years ago; and they would turn to these now again. Is there a science of experimental medicine of which the actual material for study is the human patient? Or is scientific work by the physician or the surgeon limited to the application in his art of scientific results worked out elsewhere in the laboratory and delivered to him for use?

The mere fact that these questions can be seriously asked suggests that in the field of clinical medicine there is not yet any stabilized or organized branch of science. No one would ask whether or not physiology, or biochemistry, or pathology, is organized as a branch of science, or wonder whether there is or is not an

academic career open to young men in any of these subjects, modest as their rewards may be. In each of these, as in other sciences of non-medical kinds, there is a well-established system within the Universities of recruitment and promotion. It is plain that at present there is no such organization of a general kind in the science of clinical research.

It is important here to draw at once a clear distinction between the work of the physician engaged in practice and the work of a man engaged in the task of advancing knowledge. The proper performance of either of these two kinds of work tends to exclude the proper performance of the other. The training for one is compatible with the training for the other only along part of the way, and beyond that it is incompatible with it. The work of a consultant physician—and what is true of him is even more obviously true for men burdened with the more varied claims of general practice—is devoted essentially and primarily to the task of diagnosis; not diagnosis in general, but diagnosis of the state of the particular individual before him at the moment. Thereafter his task must again be concentrated, upon the treatment suitable both to the body and to the mind of that particular man, woman or child. Both these processes of diagnosis and treatment demand for their due performance the devotion of long experience, the exercise of practical arts of eye, ear and hand, habitually cultivated, as well as quick, intuitive decision that only inborn aptitude and long years of observation can bring. The duty the physician owes to his patient is to give him all the best he has of his high art, an art blended of qualities of personal character, practical dexterity, and knowledge. His skill used both in diagnosis and treatment is rooted, of course, in scientific knowledge, and in his art he will make every application of the latest results of science. What he cannot reasonably expect, however, is that he will be able to make the advancement of scientific knowledge a primary object of his practice.

The research worker in the clinical field, on the other hand, must take a point of view different from that of the practising physician, and follow a different discipline. So far from concentrating upon the complex presented to him by any individual patient, he must ignore individuality, obliterate it by multiplying cases and study the disease process as such which is in question. In this study, as in any other branch of natural science, the worker must hope for progress chiefly from the use of the experimental method. Since human beings are to be the material of his study he must learn, of course, to deal with them with the same unselfish solicitude as that of any of his brother physicians; but his thoughts, when that has been secured must not be with them as individuals, but must be concentrated chiefly upon the task of getting new knowledge in his chosen inquiry by every experimental method open to him, whether at the bedside, or in the laboratory.

We must remember, too, that if his hope is to bear knowledge a little further forward, he must be prepared to live a "devoted life" like that of any other serious man of science. He must not only attack his problem at given times in the day, but have them in mind through most of his waking hours. He must read widely and deeply in the scientific literature of all countries.

Instances of particular men, lucky in their gifts or in their circumstances, may be quoted here and there which may seem at this point or that to obliterate the distinction just drawn between these two different careers in medicine. We must not look, however, for the exceptional cases offered by the rare genius or by some unusual set of opportunities. Nor must we look at exceptional and specialized parts of medicine in which professional practice and research work may come nearer akin—as for instance in the study of the nervous system and of the sense organs. For practical purposes we must look at the main features of the problem in its most normal form.

From the beginning of their work fifteen years ago it seemed obvious to the predecessors of the present Council that if scientific work in clinical medicine was



to advance upon a broad front in this country it could only be by some radical change of organization. It could not be expected to make progress under the conditions then characteristic of the great teaching hospitals in various parts of the country. The Council was faced with the alternatives of establishing a separate research hospital analogous to that which is attached to the Rockefeller Institute in New York, or, on the other hand, of making special arrangements within the walls of an existing hospital for purposes of study or education. Of these two plans the former was rejected because, as the Council explained, it seemed to them to have "the grave disadvantages of extravagant cost and of a wasteful divorce from the current system of medical education." They adopted the latter plan, and as a first installment of it they set up in 1915 the first effective hospital "unit" by appointing Dr. (now Sir) Thomas Lewis, who was already a physician upon the staff of University College Hospital, to be a member of their whole-time scientific staff, and made such provision that his whole energies, with those of junior workers associated with him, could be given to research work in clinical medicine. By-passes should be laid upon two conditions essential for progress in investigation that were ensured to him. First, by the conditions of his service he was freed entirely from private practice, so that not only his working hours but as much as he cared of the margin of leisure would be given to thought and reading. Second, by having no general teaching and clinical responsibilities he had no need to maintain his knowledge and skill at crown pitch over the whole clinical field and was set free for intensive exploration of his chosen and limited part.

Of the value of this experiment and its results there can be no serious doubt. Two years ago the Council briefly reviewed the main outcome of the first ten years of work under Sir Thomas Lewis in this unit in the scientific study of the heart and blood-vascular system by diseases and their treatment. They wrote, "It is not an exaggeration to say that the output of valuable work from this centre in the last decade has constituted the central stream of progress made in these subjects elsewhere." They think the truth of this will be increasingly recognized both here and in foreign countries.

The questions asked in the first paragraph of this Question may now be confidently answered in the light of actual experience. There is a science of experimental medicine. Clinical research work in which the material for study is the human patient can still be a hard reality, though the methods by which success is achieved are changing from those of the direct bedside or post-mortem room examinations that gave such a harvest of knowledge to the clinicians of last century. The work of these men has almost exhausted the yield that can be got by gathering the crops as they grow. The methods now needed are those that carry the worker into the intimate recesses of physiological mechanism and pathological thought.

It may be recalled now that in 1917 the predecessors of the Council addressed to the Board of Education, to request a memorandum upon the subject of progress in clinical medicine. In this they gave it as their reasoned opinion that the general cause of medical research was being gravely retarded by the traditional mode of entry to hospital wards for want of a system in which research work could proceed under the modern conditions necessary for scientific progress. They urged that the immediate opportunities for research in the hospitals were being wasted, while the system yielded no proper supply of men trained to make use of better opportunities elsewhere.

In 1929 the Government, first through the Board of Education and later through the University Grants Committee of the Treasury, made financial provision for setting up University clinics on the "unit" system at certain selected hospitals in London. This decision was taken in sequence to Sir George Newman's Memorandum of 1918 to the President of the Board of

Education, in which he had insisted that the need for improvement of clinical teaching could be met only by the appointment of paid professors of the clinical subjects who could devote their time to teaching and research. The main qualifications for the new appointments, however, were to be ability to teach and to organize teaching, though a section in the Memorandum dealing with research and with the work of the Medical Research Council did insist that a teacher could not be effective unless he were inspired by the spirit of discovery.

It should be noted that for several years the new clinics lacked adequate laboratories for their work, and that these facilities have not been provided by Treasury funds, either through the Board of Education or through the Medical Research Council, but have come successively to four of the Units by gifts from the Rockefeller Foundation and from the trustees of Sir William Dunn. From the beginning the Council have deliberately given assistance by substantial grants in aid of research though they were unable to provide money directly for the building of laboratories.

Now that nearly a whole decade can be passed in review the time has come for considering whether and in what degree the University clinical units are in a position to contribute to progress by research as well as to progress in education. They were designed in the beginning to give a higher and more advanced kind of teaching as well as to organize the elementary instruction. They were to impart to the more able students such higher qualities of trained critical judgment as would fit them for the best kinds of practice, while at the same time they were to train others for an academic life of scientific clinical research. It is the latter aim that directly touches the sphere of the Medical Research Council and the plans which they may hope to make for the better development of research throughout the country.

So far as the Council are qualified to form a judgment, it would appear that the functions of clinical teaching have been performed by the units with remarkable success. If this be so, and there can hardly be a doubt of it, it will readily be understood that the time and attention given to this important work, of which the present magnitude was not originally foreseen, must have diverted energies from other tasks. The absorption of the University units in the work of general teaching not only draws heavily on the energies of their directors and staffs, but also tends to prevent the essential conditions for research work being provided within the unit. For teaching purposes the beds must be so filled, and kept filled, as to illustrate as completely as possible the whole normal range of medical work in all its clinical fields. Research work, on the contrary, requires concentration upon some particular disease or some special aspect of disease. The purposes of clinical education are in this sense not wholly compatible with those of clinical investigation.

The heavy demands thus made upon the units in their work of teaching over the whole field of medicine have necessarily limited the volume of spontaneous and successful research work coming from them in the aggregate. Reason of another kind can also be shown for the fact that the assistantships, whether in these University units or in the research unit supported by the Council under Sir Thomas Lewis, have not hitherto produced many men able and willing to devote themselves to a life of clinical research in experimental medicine.

The present dearth of such men, both among the assistants trained in the units and generally in the country, has, in the view of the Council, two main causes. One is the novelty of a career in which a man will be ranked rather as physician on the one side than as physiologist or pathologist on the other. The other and weightier factor is the absence of stable positions in which such a career may be pursued and developed with proper facilities and with reasonable remuneration.



The positions available for appointment and promotion in this field have been closely limited by the fact that during these years the system of units for teaching and research has not hitherto spread generally, or indeed at all in the medical schools outside London where no financial provision has been made specially available for them. By financial aid generously given by the Rockefeller Foundation of New York, and only because of that aid, arrangements analogous to those of the London units were made in the medical schools both at Edinburgh and at Cardiff. Local conditions have obstructed progress at Cardiff; in all the other centres of medical teaching throughout Great Britain there have been on the whole no such effective changes within the Universities or the teaching hospitals as to alter the traditional situation as the Council described it in 1917. One notable exception to this, however, is provided at Sheffield, where the Professor of Pharmacology, Dr. Edward Mellanby, F.R.S., has been given control over forty beds under conditions that allow scientific work to be done there, both in the wards and in the associated laboratories, as effectively as in any other branch of science.

What is the inducement now held out to an able young man to make his life-career in advancing knowledge in clinical medicine? A man fit to receive a research grant in this field, whether from the Council or any other responsible source, is a man who will be well trained as a clinician as well as skilled in laboratory work. This double ability exposes him to double temptation. Upon the clinical side he is under continual temptation to exchange the present uncertainty of promotion and ultimate reward in scientific clinical work for the relative certainties of professional practice. As a practitioner he will have the certainties and pleasures of daily usefulness in exchange for the uncertainties and common disappointments of the research life. As a practitioner he will have fresh human interests and many new friends in exchange for the relative obscurities of the laboratory and ward. Brilliant success in research, even if measured by high international standards of value, will bring him at best a moderate fixed salary. But moderate ability combined with good luck in professional practice may make him a rich man. The second temptation comes from another side but it is equally strong. It is the temptation to leave clinical research for purely laboratory work in one of the recognized and well-organized sciences, which do at least offer relative certainties of fair promotion, and to look for advancement along the ordinary lines of an academical career in the University world.

The problem which the Council must keep before them is that of determining the best mode of fulfilling their national responsibilities in so far as these relate to promoting the growth of scientific knowledge in clinical medicine. Their present consideration leads them to the following conclusions.

(i) The experiment of providing a man of proved capacity for clinical investigation, with proper resources for his work and the right conditions for using them, has proved to be an unqualified success. A direct harvest has been reaped in valuable additions to knowledge, and numerous younger workers, both British and foreign, have been profitably exercised in the methods of research.

(ii) Except among the very rare persons combining inclination with good brains and private means, there can never be a successful and maintained recruitment of young men of ability for clinical research until there are at least a few stable positions in sight, the occupation of which at middle-age will provide reasonable remuneration and adequate power of educating a family. It was hoped originally that the directorships of the University clinics in London, with others that might be established elsewhere in the provinces, would provide posts sufficiently numerous and attractive to keep the abler men at the work of investigation with the ambition of succeeding to them. But a young man able enough to advance knowledge is not likely to be attracted by a post to which he might be appointed in

the future if his occupation of it is to bring such burdens of teaching and administration as would greatly debar him from the very research work that it is his ambition to pursue.

(iii) The Council hope that some advance towards the solution of this national problem may be made by a clear statement of their intention to do what is in their power to encourage still further the scientific and direct study of disease in man. They wish to recruit in the near future young workers of ability who are prepared to test themselves in this branch of medical research with the view to its becoming their life work. They are not only prepared to help these recruits to the utmost of their power in a preliminary period of training and probationary work, but also announce their intention of increasing the number of workers in the clinical field upon their permanent staff as soon as they are able to select candidates whose training is adequate, and whose work in this field has already proved of such fertility that the candidate on the one hand and the Council on the other may have confident hopes of his success in a career of research.

#### *Radium and cancer.*

In the introduction to their last Annual Report, the Council made special reference to their scheme of research into the methods of treating malignant disease by radium: this work they had been able to promote at various hospital centres by means of the quantity of radium salt, collected from war stocks, which was entrusted to them nine years ago by H. M. Government. They described the transformation of the general situation which had taken place during the period of these investigations. At the beginning there had been no systematic and comprehensive study in this country of the therapeutic properties of radium: its clinical use was wholly empirical and the results obtained were of doubtful value. Year by year knowledge increased, methods were defined, and results improved. From being little more than a palliative measure to be employed in inoperable cases, or a supplementary treatment following removal of the main growth, radium therapy had become a curative method of primary value in several types of cancer and already in some instances it was superseding purely surgical procedures. The Council mentioned also the question, raised by these increasingly hopeful developments, of the provision of adequate facilities for radium treatment throughout the country. They pointed to the need for a national scheme of treatment, combined with further research, which should retain and expand the existing centres and should be supervised by a single co-ordinating body.

The Council have naturally been gratified by the great progress in those directions that has been made in the past year. In 1928 they had recommended to the Lord President of Council that a Government inquiry into the needs and possibilities of a national scheme should be instituted. This recommendation was referred to the Committee of Civil Research, who then appointed a special Sub-committee, upon which the Council were represented, "to examine the radium requirements of Great Britain in relation to present sources of supply, and to submit recommendations." The report of this Sub-committee, published early in 1929, has been adopted by H. M. Government. In accordance with the recommendations made, a National Radium Trust and a Radium Commission have been set up, and funds for the purchase of radium have been provided both by Parliament and by public subscription. These provisions will bring radium treatment within the reach of very many more of the sufferers from the disease within the country than those who have hitherto had benefit from the radium work promoted by the Council, and they will greatly enlarge the present opportunities for the advancement of knowledge.

The Council hope that the new national scheme will give a fresh impetus to investigation, so that the medical uses of radium may be still further improved and extended; and also that it may provide such

opportunities for post-graduate instruction that the number of men and women qualified to use the methods of radium-therapy may be rapidly increased. As they pointed out last year, research and treatment must go hand in hand. In a case of this kind, where the subjects of study are the methods of clinical application, all research is at the same time treatment and is for the good of the individual patient. Equally, seeing that knowledge is still far from complete, all treatment should be regarded as research work, directed not only to the relief of the immediate patients but to the improvement of methods for future use. In view of their strong convictions on this point, the Council have greatly welcomed the recent public declaration of policy by the Radium Commission, in which prominence is given to considerations of this kind.

The Council have also been glad to learn that one of the first decisions of the Radium Commission has been to concentrate the new supplies of radium at centres where adequate facilities of all kinds for its use, and proper safeguards against its dangers, can be guaranteed. This will secure that the best and most economical methods of radium-therapy will be available for the greatest number of those needing it in the country. The supply of men and women having the necessary experience in this highly specialized form of treatment is at present very small, and concentration of the work for that reason among many others appears to the Council to be an essential for success.

Meanwhile the Council are making preparations to review and reconstruct, with the advice of their Radiology Committee, their existing schemes of radiological research. This will be done in the light both of the new needs and the new opportunities that the work of the Radium Commission may reveal as it develops.

#### *Physiology of the special senses.*

In the period of years now reviewed the Council have made special efforts to promote a more active study in this country of the physiology of the senses, and especially those of vision and hearing. It became apparent soon after the war that the disinterested study of the physiology of the sense organs was receiving very little attention in the schools of physiology within the Universities. The deaths of Professor Gotch at Oxford and of Dr. Rivers at Cambridge had left no successors in their special fields to continue their distinguished work. It is not unnatural that problems of sense perception should have attracted the attention of physicists, and the classical researches of Helmholtz in Germany and the late Sir William Abney in this country in relation to vision, and those of the late Lord Rayleigh in relation to hearing are most effective illustrations of this. But work like theirs, again, has not in recent years attracted the attention of physicists in succession to them.

The utilitarian need for more active and extensive research work in the applied physiology of the visual and auditory senses, like the needs felt in so many other directions of scientific work, became sharply apparent during the war. The rapid development of auditory methods for the detection and location both of submarines and aircraft, and the new demands made upon visual perception and acuity by new developments in signalling and gunnery called at once for fresh applications of physiological knowledge. In the main the immediate needs of the war were effectively and rapidly met, but during the subsequent years of reconstruction it became more and more clear that this branch of physiology was in danger of falling into something like neglect. In 1924 the British Medical Association forwarded to the Council the resolution of a meeting fully representative of the ophthalmologists of Great Britain, urging them "to press strongly upon the Government the great need for research upon many unsolved problems of vision in relation to the requirements of the combatant Services."

It seemed to the Council that if, in co-operation with the fighting Services, better provision could be made for the investigation of specific problems by workers

in University departments, brought into close touch with specialist officers within the Services, attention would be drawn to the subject at the Universities, and that there might appear investigators worthy to carry on the interrupted traditions of this branch of physiology.

Accordingly in 1925 the Council, after consulting with the Admiralty, the War Office, and the Air Ministry, appointed a Committee to initiate and supervise research work in the physiology of vision, to co-operate with other Government Departments, especially the Service Departments, in studying problems involving questions of vision, and in so doing to promote so far as possible the attention paid to the subject generally at the Universities and other centres.

This was followed by the appointment in 1926 of a Committee constituted on similar lines to deal with research in the physiology of hearing.

A summary account of the recent work of these two Committees is given in the report. It will be seen that already they have produced in a short time some notable contributions to theoretical knowledge and to its application in practice. Generally speaking it may be said that, while they have endeavoured to deal at once with the practical Service problems referred to them (as for example the revision of the existing code of visual standards for the Navy), they have not attempted any rapid solution of the wider and more general problems of vision, such as those involved for instance in the effects of "glare" and "flicker," but have preferred to initiate fundamental researches upon various aspects of vision and hearing, in confidence that definite new knowledge when it emerges will be applicable with all the greater assurance to the practical conditions of living.

#### *Publication of a system of bacteriology.*

At the beginning of the quinquennium now reviewed, the Council had just brought to a close, for reasons fully explained at the time, their monthly publication *Medical Science; Abstracts and Reviews*. This after the close of the war had succeeded the *Medical Supplement*, by which scientific information was conveyed rapidly to the scattered laboratories in all the war areas. Upon the advice of their Bacteriology Committee they thought it well to make provision for publishing a systematic conspectus of knowledge in that subject, made as complete as possible by the united efforts of leading workers in its various divisions. Except in the German language, such a "system" has not hitherto been available. The Council are under a heavy obligation to the numerous men of science who have aided them in this endeavour, and in particular they must name Dr. Paul Fildes, who has borne the chief share of the duties of editorship and organization. The work in nine volumes is now in process of publication, and three volumes have already appeared. An interesting preface to the whole work was written by Lord Balfour as almost his last official act as Chairman of the Council. All available means have been used to produce what is necessarily a costly work at the lowest practicable price.

## Correspondence.

### AN UNDIAGNOSED MALADY.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—During my last two years of service in this dispensary a large number of deaths have occurred, attended by similar symptoms, in patients aged from 3 to 15 years. In all cases the history has been one of simple fever for 7 to 8 days, in some instances however of only 3 to 4 days. Thereafter the temperature suddenly becomes subnormal, and severe collapse sets in, the pulse being imperceptible, the extremities icy cold, and cold sweating present over the face. The patients become restless, tossing from one side to the other.

Death supervenes in from 3 to 5 hours after the onset of collapse. Slight jaundice of the conjunctivæ was noticed in all cases.

With regard to treatment, an enema was given in all cases where there was a history of constipation. When collapse supervened hypodermic injections were given of strychnine, digitalin, pituitrin, musk in ether, camphor in oil with ether, strophanthin. In some cases quinine bishydrochloride was given intramuscularly, in the belief that they were cases of algid or cerebral malaria. Brandy, spiritus ætheris, and alkaline mixtures were also given by the mouth. In spite of such measures all the cases proved fatal. As this place is situated close to the Nepal boundary, malaria is extremely prevalent. But there were no facilities for blood examination.—Yours, etc.,

JATINDRANATH BOSE, L.M.F. (Bengal).

BHUTABA, SIKTI P. O.,  
PURNEA,  
30th May, 1930.

### SCIENCE VERSUS ART IN MEDICINE.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—The two special articles in the May 1930 number of the *Gazette*, one by Lieut.-Col. Berkeley-Hill and the other by Col. Christophers, are not only extremely interesting but deserve more than mere passing notice.

Col. Berkeley-Hill's article emphasizes the *art of medicine* in the more intimate *study of man*, the *individual* in disease, while Col. Christophers' article emphasizes the *science of medicine* in the *study of man* in the *mass* in health and ill-health.

The two articles in question thus discuss broadly the two aspects of modern medicine, viz., its "art" and its "science." The former comes from the pen of a great clinician at the bedside, illustrating the application of the "art of medicine" in his own special sphere—psychology in medicine. The latter comes from the pen of a great research worker and laboratory man, explaining how and why modern medicine is scientific.

In my article—The "Study of the Individual"—*Patna Journal of Medicine* (January 1930), I have emphasized the "study of the individual" in both health and disease, that is from both physiological and pathological aspects, as well as its practical application in the sphere of treatment and prevention.

There I have pointed out that the trend of modern medicine is slowly but surely turning towards the "study of the individual" as opposed to the "study of man in the mass" in both health and ill-health. This change in the angle of vision of modern medicine has been brought about by the advent of the newer physiology in the sphere of endocrinology and biochemistry, as also by the study of the "pathology of constitution" over and above that of the "pathology of infection."

The "art of medicine" has not progressed *pari passu* with the "science of medicine." While "mass hygiene" has considerably advanced, we know very little of "individual hygiene," how a man can keep healthy and how we can prevent him from becoming ill. For with the brilliant researches of Koch and Pasteur we began the study of "mass physiology" in both the normal and morbid spheres as well as of "mass" as opposed to "individual hygiene." We have paid too much attention to the "seed," practically ignoring the "soil."

It is interesting to note in this connection that ancient medicine both in the East as well as the West, studied medicine more as an "art," paying more attention to the "soil" than the "seed," concerning which they made some accurate guesses. Charak for example had stated that certain diseases like leprosy are induced by very small organisms, *so small as to be invisible to the naked eye*.

The ancients also attempted to study medicine as a science. Hippocrates and Galen in their theory of "humours" (somewhat analogous to "hormones"). Charak and Sushrut in their "tridosh theory"

(somewhat analogous to sympathetic endocrinology), Hua-Tō and Pion-chi-as (the Hippocrates and Galen of China) in their theory of "Yang" and "Yin" (somewhat analogous to the acid and alkali-ions of biochemistry) tried to find the "science of medicine." These ancients were however much handicapped on the one hand with want of knowledge of collateral sciences such as biology, chemistry, physics, etc., and on the other with absence of knowledge of modern instruments such as the microscope, etc., as well as modern laboratory methods. Ancient medicine was not therefore strictly scientific in the modern sense of the term, though the leaders of medicine in those by-gone ages were great clinicians and greatly excelled in the art of treatment and individual hygiene.

A medical system can only be called scientific when the "art of medicine" is based on the "science of medicine." A man may be practical without being highly scientific in medicine.

The practical question that arises in this connection is, whether our medical students are to be thoroughly trained in the "science of medicine" to become scientific men, or in the "art of medicine" to become practical men. There is some force in the criticism that the medical students of the present day are becoming more scientific but less practical. The laboratory is getting the upper hand over the bedside clinic.

Leonard Williams (*Minor Maladies*) states that while the majority of medical students after passing out are well acquainted with the very delicate and subtle methods of diagnosis of the most intricate cases, they are a hopeless failure in treating the majority of even minor ailments met with in every day practice, after graduation. In fact the "art of medicine" is slowly and laboriously picked up in the course of medical practice after repeated failures. Our young M.Bs. are mere degree holders of medical science, just as our B.Scs. of science in general. This is perhaps one reason why they welcome so many patent and proprietary medicines with which the market is flooded and their practice degenerates into anything but scientific medicine.

How to modify the training in our teaching institutions, is the crux of the problem. Every "art" requires a thorough practical training and this is true of medical art as well.

My humble opinion is that there should be a higher and lower course. In the lower course the students should be grounded in the principles of medical science, taking particular care to teach the medical art. The professors should be part-time teachers, being successful practitioners. Such a training will enable the bulk of our students, who turn out to be general medical practitioners, to be better prepared for successful practice.

The higher course, which should be a post-graduate course, should take the best passed students who have a tendency towards research work or who wish to become specialists. Their teachers should be specialists and original research workers and they should be whole time men. The students should be thoroughly taught the details of scientific medicine and undergo special training for the future specialist in his subject.

For this purpose the medical schools should be reserved for the lower and the medical colleges in the province for the higher course only. The distinction between assistant surgeon and sub-assistant surgeon should disappear, for so far as the "medical art" is concerned, the latter is in no way inferior to the former.—Yours, etc.,

A. T. ROY, L.M.S.

HAZARIBAGH,  
25th May, 1930.

### UROBILINURIA IN MALARIA.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—I have had many queries regarding my article "Urobilinuria and its importance in malaria" which appeared in July 1930 in the *Indian Medical Gazette*.

I shall feel thankful if, for the information of your readers, you will kindly insert the following lines.

Paradimethylamidobenzaldehyde can also be used for the test in place of Paradimethylamidoazobenzaldehyde. This reagent can be had from Messrs. Smith, Stanistreet & Co., Ltd., Calcutta. Failure to get a positive reaction in many fevers of short duration is in favour of the fact that they are not malarial, although they may yield to quinine, or in fact to any medicine prescribed. I shall feel thankful if your readers will kindly write to me of their experiences with the test. I am sure they will find it of great use in fever cases.

It is suggested that both the tests given for urobilin should be done in order to prevent mistakes.—Yours, etc.,

JAMIAT SINGH, M.D., M.R.C.P. (Edin.).

AMRITSAR,  
25th August, 1930.

### TRANSIENT GLYCOSURIA IN A COMATOSE PATIENT.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—Dr. Rabindra Nath Chatterjee confesses to being completely at a loss to account for the transient glycosuria in his comatose patient, the details of whose case appeared in the August number of the *Gazette*.

He has eliminated the following causes, diabetes mellitus, alimentary glycosuria, kidney with leaky threshold, and the administration of phloridzin.

There remains at least one other cause. It was Claude Bernard who first showed that puncture of, or severe injury to, the floor of the fourth ventricle leads to glycosuria.

From Dr. R. N. Chatterjee's case notes it is evident that his unknown comatose patient was suffering from well-marked cerebral contusion (described in textbooks as concussion of the brain). The deep coma, epileptiform convulsions, hyperpyrexia, dilated pupils (they are usually contracted); later, the lethargy, mental confusion, incoherent speech, slow pulse-rate all confirm the diagnosis of a head injury.

The exact pathological condition underlying the symptoms of cerebral contusion (concussion) is a matter of dispute. It has been suggested by Duret that "the symptoms are caused by a wave of cerebrospinal fluid, produced by the blow, passing out of the lateral and third ventricles through the aqueduct of Sylvius, and distending the fourth ventricle. This distension stimulates the restiform bodies, and produces an anæmia of the brain, which brings about a depression of the cardiovascular centre in the medulla."

In Dr. Chatterjee's patient, not only was the fourth ventricle distended, but hyperdistended and the floor injured.

The occasional appearance of transient glycosuria after head injuries is a well-established fact. Its presence does not affect prognosis, and its treatment never calls for the use of insulin.—Yours, etc.,

E. J. CREAIS, L.M.S.S.A. (Lond.),  
LIEUTENANT, I.M.D.,  
Civil Surgeon.

SANDOWAY, BURMA,  
26th August, 1930.

## Service Notes.

### APPOINTMENTS AND TRANSFERS.

LIEUTENANT M. R. SINCLAIR, I.M.S., is employed on Special Duty under the orders of the Political Officer, Sikkim, with effect from the 15th July, 1930, and until further orders.

Major W. P. Hogg, D.S.O., M.C., I.M.S., is appointed substantively to be an Agency Surgeon under the Government of India in the Foreign and Political Department, with effect from the 9th October, 1929.

Major B. H. Kamakaka, M.C., I.M.S., is appointed substantively to be an Agency Surgeon under the Government of India in the Foreign and Political Department, with effect from the 9th May, 1930.

### LEAVE.

Lieutenant-Colonel J. B. Hanafin, C.I.E., I.M.S., Assistant Director-General, Indian Medical Service (Sanitary), is granted leave on average pay for 1 month and 22 days combined with leave on private affairs for 1 month and 12 days, with effect from the 23rd July, 1930.

### PROMOTIONS.

*Lieutenant-Colonel to be Colonel.*

L. P. Brassey, M.B. Dated 12th July, 1930.

*Lieutenants to be Captains.*

R. D. Alexander, M.B. Dated 21st November, 1929.

S. C. Bakhle. Dated 28th February, 1930.

S. S. Bhatnagar, M.D. Dated 2nd August, 1930.

B. Chaudhuri, M.B. Dated 2nd August, 1930.

H. L. Batra, M.B. Dated 2nd August, 1930.

A. V. O'Brien, M.B. Dated 15th August, 1930.

S. T. Davies. Dated 15th August, 1930.

S. M. K. Mallick, M.B. Dated 18th August, 1930.

C. Mani, M.B. Dated 19th August, 1930.

E. S. S. Lucas. Dated 20th August, 1930.

*Lieutenant to be Captain (Provl.).*

H. W. Farrell. Dated 31st August, 1930.

### RETIREMENTS.

Colonel L. J. M. Deas, M.B., F.R.C.S.E. Dated 12th July, 1930.

Lieutenant-Colonel D. McN. Taylor, M.B., 31st July, 1930.

Lieutenant-Colonel D. Heron, C.I.E., M.B., F.R.C.S.E., 3rd August, 1930.

Lieutenant-Colonel G. I. Davys, O.B.E., M.D., 3rd August, 1930.

## Notes.

### THE CAMBRIDGE PORTABLE ELECTRO-CARDIOGRAPH.

A SMALL BROCHURE published by the Cambridge Instrument Co., Ltd., 45, Grosvenor Place, London, S.W. 1, is their "List No. 980," describing the Cambridge portable electro-cardiograph. The following are notes on this extremely interesting apparatus taken from the brochure:—

"The important part played by the electro-cardiograph in connection with the diagnosis, prognosis and treatment of heart disorders is being increasingly recognised by members of the medical profession. Its value is frequently emphasized in articles which appear in medical journals, and a knowledge of the science of electro-cardiography has latterly become essential for those who desire to profit by the increasing literature on disordered rhythms of the heart. A few years ago only the larger hospitals were equipped with installations, but the apparatus is now being used extensively by consulting physicians and in private practice. This increased field of usefulness has created a demand for a portable form of equipment which can easily be taken to a patient's house when it is impracticable to move the patient to the doctor's consulting room, and which is also suitable for use in the consulting room in the ordinary way, or can be used with obvious advantage in a nursing home. Such an outfit must of necessity be compact in design, robust in construction and require the minimum of adjustment.

The new Cambridge portable outfit possesses all these features. The apparatus is permanently assembled ready for immediate use, the necessary connections to the

patient and to a 12-volt battery, which forms part of the equipment, being simply effected by non-reversible plugs.

In order that the records obtained with this new model may be strictly comparable with all published work to date, the recording system adopted is the same as that used in the apparatus employed by the workers in cardiology since the commencement of this method of diagnosis, namely, an Einthoven string galvanometer of high sensitivity working at a projection distance giving a magnification of 600 diameters. The apparatus therefore comprises the fundamental parts of the standard equipment, suitably condensed in form, the technique being practically the same. It is to be noted that the apparatus does not employ any system of valve amplification, and consequently, it does not depend on the fitting of special replacement valves in the event of a break-down, nor is it necessary to maintain a constant high tension current, while the curves cannot be variably distorted by valve characteristics varying with age, or by transformers or condensers.

In the latter pages of the list are reproduced a number of comparison electro-cardiograms taken on the same patient and, in some cases, simultaneously, with the portable electro-cardiograph and with the standard electro-cardiograph outfit. The records, clearly demonstrate the fact that those obtained with the portable instrument are exactly comparable with the records obtained with the large standard outfit recently supplied to this well-known institution.

Information regarding other Cambridge instruments for physiological and medical investigations, such as the standard types of electro-cardiographs, Mackenzie-Lewis polygraphs, microtomes, CO<sub>2</sub> indicators for alveolar air, and hydrogen-ion apparatus, is contained in other catalogues, any of which will be forwarded upon request."

#### HICKS' THERMOMETERS.

We have been asked to draw the attention of our readers to the advertisement of Hicks' clinical thermometers which appears on p. lvi of this issue. Nothing is more important to the medical practitioner than a really reliable clinical thermometer, and it is not uncommon to find cheap patterns on the market which may be as much as 1.5 or even 2°F. wrong; we have even known a "*Bacillus coli* septicæmia" to clear up completely as soon as a new thermometer was purchased! Messrs. J. J. Hicks are certainly the premier thermometer makers in the world, their business has been built up on their guarantee of accuracy, each thermometer being tested by an expert before it leaves the factory. The Indian agents are Messrs. Allen & Hanbury (A. H. P. Jennings, Esq., special representative), Block F 4, Clive Buildings, Calcutta, and they be pleased to forward price lists on application.

#### ELIXIR VALIBROM B. D. H.

VALERIAN has been employed in medical practice for many years on account of its valuable sedative action and its freedom from toxic effects; it is only comparatively recently, however, that a method has been devised for deodorising preparations of this drug. To-day such deodorised preparations are being widely prescribed, whereas formerly valerian preparations were rather avoided on account of their unpleasant odour.

Such a recent preparation is "Elixir Valibrom" of the British Drug Houses, Ltd. It is stated to contain chloralamide gr. xxx, potassium bromide gr. xxx, and extract of valerian gr. ii, to the oz. The average dose is one teaspoonful for adults, and the preparation is indicated in the treatment of insomnia, hysteria, chronic alcoholism, biliary and other colic, and in overcoming the opium habit.

A second preparation by the same firm is "Extract Valibrom Compound." This is stated to contain 10 minims to the oz. of liquor morphinæ citratis co. in addition to the above formula. Its use is indicated in the more severe types of cases of insomnia, especially

where the insomnia is due to excitement, hallucination, or to severe pain.

#### "VITAVOSE"

To-day is the era of vitamine therapy, and it is of considerable importance to the medical profession that such products as are prescribed should come from reliable sources. In America one of the pioneer firms in such investigation is that of E. R. Squibb & Sons, of New York, whose products have long been known for their reliability and for the high quality and vitamine content of their cod-liver oil. This firm has recently successfully developed a product stated to be particularly rich in vitamin B, called "Vitavose," and derived from the embryo of wheat grain. It is claimed that "Vitavose" is not only very rich in vitamin B, but also in the naturally occurring iron salts of the wheat germ, that it contains 100 times as much vitamin B and 40 times as much iron as milk. It is a light golden yellow sweet substance and palatable. It can be used to replace ordinary sugar in the artificial feeding of infants, but also has a wide range of usefulness for adults and children where the administration of vitamin B is indicated.

#### ENTEROSOL-COATED TRYPSOGEN TABLETS IN DIABETES.

THERE has been a widespread demand in the medical profession for an enteric-coated tablet of pancreatic gland substance, which would protect the gland material from the digestive processes of the stomach, but which would dissolve in the small intestine and permit immediate absorption. An effective coating of this kind has been developed in the research laboratories of the G. W. Carrick Co., and they have put on the market "Trypsogen Enterosol Coated." It is claimed that this coating is physiologically inert, contains no salol or other active material, and will pass unchanged through the stomach and dissolve in the intestine. The gland material is thus delivered into the small intestine, ready for immediate absorption.

Full literature regarding this product may be obtained from the G. W. Carrick Co. (Messrs. Muller & Phipps), Contractor Building, Nicol Road, Ballard Estate, Bombay.

## Publishers' Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 reprints *gratis*, if asked for at the time of submitting their manuscripts.

Communications on Editorial Matters. Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o The Calcutta School of Tropical Medicine, Central Avenue, Calcutta.

Communications for the Publishers relating to Subscriptions, Advertisements, and Reprints should be addressed to THE PUBLISHERS, Messrs. Thacker, Spink & Co., P. O. Box No. 54, Calcutta.

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## Original Articles.

### FIVE YEARS' ANTI-MALARIA MEASURES ON THE TRAVANCORE TEA COMPANIES' ESTATES.

By WM. WESLEY CLEMESHA, C.I.E., M.D., D.P.H.,  
 LIEUTENANT-COLONEL, I.M.S. (Retd.),

*Malariaologist to the Malaria Control Scheme, Ceylon,*  
 and

J. H. MOORE, M.B., B.Ch., B.A.O. (R.U.I.),

*Chief Medical Officer, Travancore Medical Fund.*

WE have been engaged in anti-malaria work over a large area in Travancore for the past six years, and consider that the results we have obtained may be of interest to other people so engaged. By way of introduction may we be permitted to remark that in 1925 one of us, Col. W. W. Clemesha, was consulted by the Travancore Tea Estates Company as to the best way of mitigating the scourge of malaria on several of their estates, some of which had considerable difficulty in showing a profit in unhealthy years. The second writer, Dr. J. H. Moore, is Resident Medical Officer in charge of this group of estates in this part of Travancore. Altogether he has forty-two estates under his care belonging to several different Companies, some of which are malarious and some are not. The senior writer first visited this district in the height of the malaria season of 1925 and has never lost touch with affairs on the estates of the Travancore Tea Estates Company from that time till the present. It is the work on these estates that we particularly wish to discuss. One of us (J. H. M.) has introduced the same methods on many of his large list of estates, and his own figures show that very satisfactory results have been obtained on many of these, varying however with the amount of attention that agents have paid to his recommendations.

Travancore is a large and prosperous Native State situated very near the south end of India. It is located on the western or Malabar shore of India and lies between latitudes 7° to 9° north. In the territory lies a range of hills, which are known as the Western Ghats. These rise to a height of 6,000 ft. or more. There are a large number of upland plateaux among these hills. Tea is grown on these slopes between 2,400 and 4,000 feet altitude; rubber at less. Ravines and mountain valleys are very common on these hills and for the most part they are inclined to be malarious. The flat area of country between the sea and the foot-hills is usually free from the disease.

#### *Climate.*

The climate is similar to that in the rest of South India, there being a well-defined dry and

cold weather season, during which time rain is not very heavy but does occur in certain parts when the north-west monsoon prevails. The dry hot weather consists of March, April and May. There is a very strong monsoon period of four months, namely, June, July, August and September, during which about 90 inches of rain usually falls. The further south one goes in the State the less the rainfall is. The monsoon period is essentially cyclonic in nature. The rains are often extremely heavy.

#### *Period of anopheline activity.*

In the plateau the period is extremely sharply defined and is spread over four months, namely, the latter half of March, April, May and June, until the rains break. The varieties of anopheles found in the plateau will be discussed later, but as the efficient carriers are nearly all stream breeders they increase in numbers rapidly during the dry and hot months, but are always in danger of being washed away completely when the heavy rains set in. A study of the incidence of malaria in this part of the world shows that reinfection seldom occurs after July. Relapses may, however, go on longer.

The estates about which we wish to make particular remarks are situated in an extremely unhealthy valley, viz., that of the Periyar. The bottom of this depression is 2,500 feet above sea-level. The tops of the hills in the neighbourhood run up to 5,000 feet and even higher. The valley has always had a particularly evil reputation on the score of malaria. Most ravines in this part of the hill country of Travancore are unhealthy, but Periyar valley is particularly so. The reason is that a few miles above the estates is located the large Periyar dam. Most people in India have heard of this. A dam of very considerable height is thrown across the Periyar gorge so that a large lake of 20 square miles is formed with a large catchment area of some 70 square miles. The water of the lake is sent through a tunnel in the hills to the Madura districts for irrigation purposes. As a result of this, for a large number of months in the year the river Periyar below the dam is seldom properly flushed out, and that only when the Periyar lake surpluses over the sill. Consequently the river is nothing else but a chain of pools over a rocky bed with a very slight current, and is a very favourite breeding place for several varieties of anopheles, the particular one which causes most of the fever in the bottom of the valley in this part of the country being *A. culicifacies*. The following other varieties have also been found more or less plentifully:—*A. funestus* var. *listoni*, a few *A. aconitus*, *A. karwari* and the usual wild varieties. Upon the sides of the hills are many ravines, with streams at the bottom of each; some small swampy areas; a large number of



patches of seepage arising from small springs from the hill-sides are also a constant feature. The streams, patches of seepage, etc., produce a large number of *A. maculatus*, *A. listoni* and a few *A. aconitus*, particularly in the grassy edges of streams and swamps. It is obvious, therefore, that with a large number of *A. culicifacies*, *maculatus*, *listoni*—not to mention several of the more doubtful carriers

been fairly well established, though had we had more leisure several others would have claimed attention. As both the writers are paid by commercial companies it has always been our endeavour to adopt the point of view of those who pay us, that is to say to concentrate on measures which are going to reduce financial loss, rather than the more academic problems.

TABLE I.

	1925.			1926.			1927.			1928.			1929.				1930.							
	Percentage free from spleen.	Percentage with enlarged spleen.	Number examined.	Percentage free from spleen.	Percentage with enlarged spleen.	Number examined.	Percentage free from spleen.	Percentage with enlarged spleen.	Number examined.	Percentage free from spleen.	Percentage with enlarged spleen.	Number examined.	Percentage free from spleen.	Percentage with enlarged spleen.	Number examined.	Death rate per 1,000 of population.	Percentage free from spleen.	Percentage with enlarged spleen.	Number examined.	Death rate per 1,000 of population.				
<i>Munjamullay</i> .—																								
Upper division	72	28	92	86	14	90	74	26	98	91	9	100	92	8	90	..	100	..	19	20				
Factory ..	58	42	26	58	42	20	48	32	21	95	5	23	68	32	25	20	79	21	33	20				
Lower division	78	22	62	84	16	65	92	8	71	97	3	60	96	4	70	..	97	3	73	..				
<i>Tungamullay</i> .—																								
Dispensary line	29	71	45	90	10	36	80	20	39	Work of dispenser very bad; outbreak.			77	13	48	..	94	6	50	..				
Augustine line	..	..	..	50	50	10	55	45	12				..	..	..	31	..	..	..	26				
Karapens ..	53	47	60	64	36	53	54	46	55				75	25	53	..	98	2	48	..				
<i>Nellikai</i> .—																								
Top lines ..	90	10	35	95	5	40	95	5	38	98	2	36	100	..	33	..	100	..	40	..				
Upper bungalow	78	22	40	85	15	51	100	..	55	89	11	53	96	4	111	21	94	6	30	36				
Wallardie side	80	20	43	88	12	43	88	12	45	96	4	46	98	2	50	..	..	..	..	..				
Worst line ..	18	82	14	82	18	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..				
<i>Injikadu</i> .—																								
Periyar side of estate.	60	40	55	82	18	50	Measures useless; truly dreadful outbreak; lines abandoned; many deaths.			86	14	104	95	5	90	27	95	5*	93	19				
Bungalow side of estate.	90	10	48	92	8	52																		
Condemned lines.	..	..	..	75	25	12				82	18	28												
<i>Pasumullay</i> .—																								
Whole settlement on hill.	94	6	140	Not examined.			95	5	155	93	7	153	98	2	149	21	98	2*	110	16				
Two lowest lines.	72	28					75	25																
Top lines of all	100	..					93	7																
																					* New arrivals.			

*Estates that served as a control.*  
No measures of any kind adopted.

1928.	Chorakolam	..	..	..	..
	Upper lines	..	50	50	48
	Lower lines	..	46	54	69
1929.	Periyar estate	..	60	40	65
	Periyar bazar	..	75	25	21

—malaria has every opportunity of spreading if no measures are adopted to combat it. It is these measures rather than the entomological side of the problem which we wish to discuss in this note. Entomology has received a good deal of attention, and all fundamental points have

The table given above speaks for itself: it does not require a great deal of detailed discussion. It is, however, necessary to say that in publishing our results we deal largely with spleen rates. These give a satisfactory basis for estimating the improvement in the health

of a labour force, but they do not tell the whole story. Children who have lived in hyperendemic areas all their lives do not lose enlargement of the spleen readily; we have found from a great deal of experience that it takes about as long to cure an enlargement of the spleen as it does to acquire it. A child of four who has been regularly infected through several months of each year since it was born will have a large spleen, and it will take years of good treatment to reduce it, but it may have little or no fever after measures are started. On the other hand a child living in normal healthy lines, where an outbreak has recently occurred, and who has only had an enlargement of the spleen from four to six weeks, will lose this with decent treatment in a similar period of time. The main point which we wish to accentuate is that, although the rate of recovery as judged by the spleen rate is low, the amount of loss to the Company is recovered much more quickly. It is easy to see how this may happen. With scientific and vigorous anti-malarial measures, serious cases very soon cease to exist. Sixty-six to seventy-five per cent. of the loss occasioned by malaria can be removed in six months. The remaining 33 or 25 per cent. takes much longer time; yet the fall in the spleen rate in twelve months may not be anything very striking. The number of days' work lost to the Company, due to sickness from malaria, bears no relation to the spleen rate; as we have already said the former can easily be divided by about 4 or 5 in six months if measures are scientific and applied with vigour.

As will be seen from the above table we have been fortunate in having two native estates as control for our work, on which no anti-larval measures have ever been carried out. The figures are extremely interesting and represent almost exactly the condition of affairs on our estates when work commenced in 1926.

The senior writer started investigating the problem of these estates in May 1925 at the height of the malaria season. At this time conditions were extremely bad and a few weeks' work enabled one to get a fair idea of the intensity of malaria and the amount of damage done. A large number of coolies used to go to the field to pluck tea, and a fair percentage used to collapse with malaria in the field. The out-turn of work was frequently as low as 25 per cent. and even lower, for weeks together. When it is remembered that during these months there is a great deal of leaf to be plucked, the loss to the Company can easily be imagined. Hundreds of acres of tea were injured through not having sufficient labour to pluck the crop at the proper time. Consequently it is obvious that not only was there a loss in the income of the Company, which in itself is serious enough, but the tea plants were damaged, thereby interfering with their

future productivity; the damage occasioned by this is very difficult to compute. During the period under discussion—May 1925—all the cases were malignant tertian, in the earlier weeks benign tertian certainly occurred. The usual story was as follows:—A cooly sickened with malaria and was very ill from about 8 to 14 days; deaths were not at all uncommon, especially amongst children. When the fever had ceased the patient was completely incapacitated from work—for another two weeks, and in most cases convalescence was very slow and lasted about 4 to 8 weeks before the patient was able to do a full day's work. The patient was frequently so reduced in health that he had to be sent home. At the end of May it was no uncommon occurrence to find everybody in a line—men, women and children—with parasites in their blood, having enlargement of the spleen, the whole community having suffered from an attack during the fever season; sometimes three-quarters of the labour force were sick at the same time. The figures in the table cannot give any idea of the actual state of affairs; they are given for divisions or groups of lines, so that it frequently happened that there was one very unhealthy line and 3 or 4 fairly healthy ones further up the hill-side which made the average spleen rate nothing very alarming. An interesting example of what is meant will be seen by the state of Nellikai, where on the Wallardie side of the estate there was 80 per cent. free, 20 per cent. with enlargement, but the nearest line to the stream had only 18 per cent. free, 82 per cent. suffering with enlargement of the spleen.

In this valley cases of malaria commence in the latter end of March; anopheles larvæ in the small breeding places in the more sheltered localities begin to be common in the third or fourth week of February. In the Periyar river itself it is seldom that larvæ became very common until the end of March, or the first or second week of April, but, when the river does start breeding, it pours out thousands of anopheles per mile per night. It was a common occurrence to catch as many as 50 to 70 larvæ in a single ladleful at the height of the season.

Cases usually begin at the end of March and increase in number and virulence till the onset of the monsoon in the early part of June. As the normal rains are heavy in this part of the world, the breeding places are thoroughly scoured out by the burst of monsoon, and conditions begin to improve immediately after the rains set in. In the old days it used to take 4 to 6 weeks for re-infections and serious cases to cease, and, after a bad year, a large number of deaths in July and August from nephritis, due to poisoning of the kidneys with malaria toxin, were reported. In 1927 we had 22 deaths in a few weeks on one estate from this cause.

Such was the picture of the state of affairs when investigation work commenced. By the malaria season of 1926 all arrangements were made for a vigorous campaign of remedial measures, and since that date the picture given above has never been repeated, except in isolated groups of lines in the estates where for one reason or the other the measures failed.

Turning to the other side of the picture, for the last three years we have not had 10 serious cases of malaria like the ones described above; the cases that did occur were mostly Europeans and their servants, and were mild and few and far between. Most of the Europeans were infected at the Club which is located in a very bad situation. Relapses during recent years have almost disappeared. The out-turn of work even in the deadly month of May is now 98 to 99 per cent., and the Company has not lost a pound of tea through the failure of plucking since anti-malarial measures were started. Probably the change in the appearance of the children is the most striking result of the campaign. The death rate per thousand of the population per annum on these five estates is now about 20 or the same as that of an English town.

It is a platitude that one learns most from one's mistakes. During the period of the five years under review we have had two breakdowns, mention of which will be found in the table. The first one was on Injikadu in 1927. There were a series of lines on the top of a spur rather too close, in our opinion, to the Periyar river itself. At my first visit I condemned the 3 lower lines; unfortunately, although it was agreed to pull these down, other accommodation was not available by the next year, consequently coolies were housed in them. Spreading from the river to these lines a very serious outbreak took place in spite of the fact that no other breeding place in the neighbourhood was producing anopheles, and that the children were being carefully treated. The whole of this side became involved in the outbreak; practically everybody suffered from the disease and there were 22 deaths. By the next malaria season the whole of the labour force on this side of the estate were transferred to new lines, constructed on a site selected on the side of a hill, far removed from the Periyar river. Since that date no recurrence of the disease has occurred beyond sporadic cases.

The second instance of break-down occurred on Tungamullay estate. There were not so many fatalities, but it was serious because the health of the labour force suffered severely and took two years to recover. It was due to the inefficient working of the compounder in charge of the treatment and the oiling. He was an elderly man, who, when the writer was present, did very excellent work. Owing to advancing years he appeared to lose his grip on the situation and almost before we realised what

had happened the whole labour force on the estate were involved in an outbreak of the disease, the like of which we had not seen for two years previously. It was an interesting though an expensive occurrence from the Company's point of view. It demonstrated to us the truth of a point which we have always insisted on, viz., that anti-malarial measures must be begun exactly at the right time of the year if there is to be any hope of success. Although the most strenuous efforts were made to cope with the situation after cases began to occur, they only yielded very inadequate results; it was not until the malaria season proper was over that some vestige of health returned to the labour force on this estate, and it was two years before they recovered.

Before discussing the details of the measures employed, we think it necessary to make some preliminary remarks for the benefit of those who may not be very familiar with conditions on tea and rubber estates. The first and most important of these is as follows:—That a community of say 1,000 tea garden coolies, with old people and young children, live under very much better conditions than the ordinary villager. In the first place they get regular pay and hence regular meals. It is very seldom that an ordinary tea garden cooly on a well managed estate shows any sign of suffering from economic stress or under-feeding after he has been three months on the estate. New-comers and their children are frequently half-starved and often are suffering from a considerable degree of hookworm infection on their arrival, and in some cases, though not usually, are badly infected with malaria. Three months' residence on an estate with regular pay, good food and steady work effects a very great improvement in their health. In Travancore and Southern India labour is reasonably well housed, and at any rate it is safe to say that the accommodation provided is much superior to what they are accustomed to in villages.

The second most important point about the tea garden labour force is that they are under discipline. On all well managed estates the word of the superintendent is law. A good superintendent who understands his coolies never asks the impossible, he neither overdrives them nor spoils them; any reasonable orders which he gives are actually carried out with a minimum of difficulty and delay. This constitutes the main difference between a labour force and the civil population. It follows therefore that, when dealing with a labour force, it is possible to carry out a definite campaign against gametocyte carriers; such a thing is practically hopeless with a civil population. Hence anti-malarial measures are much easier to carry out, and much more satisfactory in their results in an organised institution like a tea or rubber estate than they are in villages; because on an estate one can attack

the problem from two different points of view—(a) anti-anopheline and (b) anti-gametocyte—from both flanks, whereas in a civil population it is only possible to do so from one. Any thoughtful person will appreciate the vital importance of these conditions.

We wish now to say a few words about a subject which lies at the root of all anti-malarial measures.

The senior writer of this article has been the recipient of a considerable mathematical education. During a long service in Government employment he arrived at certain conclusions, which he was never able to put to trial; after retirement, when his work lay amongst an organised colony like a tea garden or a rubber estate, opportunities occurred for testing the validity of these early conclusions which were arrived at from a study of the mathematics of the prevention of disease.

A great deal has been written on the mathematics of epidemics generally and malaria in particular by Sir Ronald Ross, Christophers, Gill, and McKendrick on tropical problems and by other well-known writers. The subject is an absorbing one and one which has been apparently entirely overlooked by certain people who have to their credit some very notable success in the field of prevention of disease. All epidemiologists, however, must take cognisance of this aspect of the subject if they wish to get the best out of their efforts. We consider the reason that it has been neglected up to the present is twofold:—(1) That the medical man's training does not predispose him to thinking on mathematical lines; his education is essentially "human" in its nature—that is the reason why it is the finest in existence. Pure mathematics and statistics cannot possibly be called "human"; and (2) that the measures, which are the logical outcome of mathematical argument, are usually entirely inapplicable amongst the civil population; they are not, however, impossible amongst an organised community like a tea garden labour force, a regiment of soldiers, a jail full of convicts, a large boys' or girls' school, etc.

We wish to avoid as far as possible complicated formulæ; we desire to state our position in the simplest possible terms:—

(1) If we could do away with 100 per cent. of the anopheles in an area the spread of the disease would cease, the number of the gametocyte carriers would decline, and the disease would die out.

(2) If we could cure all the gametocyte carriers in any community malaria would likewise disappear, and it would be immaterial how many anopheles there were.

The above are obviously platitudes; in the tropics both are impossible of realisation.

(3) A considerable reduction (66 per cent. to 75 per cent.) in the number of efficient carrier anopheles *only* may have little or no effect on

the number of reinfections if the number of gametocyte carriers in the community is high. The remaining 33 per cent. to 25 per cent. of anopheles readily become infected and are sufficient to disseminate the disease.

(This is well known to all malariologists. Christophers was, we think, the first to point out that half a dozen infected female anopheles are capable of infecting everybody in a line or a cluster of houses.)

(4) Similarly, a considerable reduction (66 per cent. to 75 per cent.) in the number of gametocyte carriers *only* will affect the number of reinfections very little if there are a large number of efficient carrier anopheles present.

(5) Manifestly, therefore, the only really scientific and mathematically correct method of stopping reinfections is to get the maximum reduction in the number of anopheles and the maximum reduction in the number of the gametocyte carriers at the same moment.

If conditions are favourable for an 80 per cent. to 90 per cent. reduction in the number of gametocyte carriers, and 66 per cent. to 75 per cent. reduction in the number of dangerous anopheles, there will be few reinfections; any that do occur are of the nature of accidents; and the progressive increase in the incidence of a disease cannot be maintained by accidents.

(6) It is well known to all students of mathematics that, given certain quantitative conditions, such as sufficient anopheles and sufficient gametocyte carriers per 1,000 of the population, the incidence of a disease must increase; decrease these vital conditions below a certain level (which can be calculated or represented by a line on a graph), and the disease must decline.

We consider that the above simple facts must govern all active measures, and failure to observe these lies at the root of practically all the break-downs in anti-malarial measures throughout the world, including our own.

No one but the veriest tyro ever expects to get a 100 per cent. success in the reduction of the number of anopheles in any locality. In the pre-plasmoquine days the reduction in the number of gametocyte carriers was a very difficult piece of work; long courses of quinine seemed to increase the number of gametocytes available in the blood on some occasions. It also follows from the above that the position taken up by certain malariologists that anti-larval measures are the only successful way of stopping malaria is wrong. It may be admitted that the anopheles being the active or living partner, while the gametocyte carrier is the passive or sleeping partner, it is better to begin with the anopheles; but our point is that it is mathematically wrong to neglect the gametocyte-carrier. Further, when only anti-larval measures are used, the results are much too slow for the commercial world, and complete

failures are fairly common. Owing to the activity of a small number of anopheles it may take years to reduce the number of gametocyte carriers below the critical level. The only thing to be said, for those who pin their faith absolutely to anti-larval measures alone, is that anti-gametocyte measures are impossible in certain communities, notably the civil population, and until recent years anti-gametocyte measures were not a success, because we had no drug that would remove gametocytes easily from the blood of an individual. All this is now changed. Consequently, both on the grounds of common sense and pure mathematics, there is only one right way of reducing malaria—that is to reduce both the number of vectors (anopheles) and the number of gametocyte carriers below a certain line simultaneously. This is now a comparatively simple matter, though it was much more difficult in 1925 when this work commenced.

There is one more interesting conclusion from the above argument; that is that there is nothing so foolish as half-hearted, slipshod, anti-malarial measures. These are worse than useless; they may cost a considerable sum of money and produce little or no improvement. It is more logical to do nothing at all than to waste money on half measures. The malarialogist must be a "whole-hogger," or he had better take to some other branch of medicine.

On the subject of anti-larval measures we have had much experience. The results, or rather the degree of success obtained, depend on many factors. These may be briefly enumerated as follows:—

(1) *The nature of the breeding place* influences the possibility of satisfactory control. Small streams, small patches of seepage can be very easily dealt with; large rivers, large swamps, etc., it may be impossible to do anything for on the ground of expense. Remember we are looking at the problem from the point of view of a business concern which must pay dividends, not from that of Government with large resources.

(2) *The size of the area controlled*; manifestly the larger the area efficiently dealt with, the greater the reduction of anopheline population will be in the centre. The area controlled is usually governed by the expense involved. Various authorities have laid down distances which have been found in practice to be reasonably satisfactory: thus, Sir Malcolm Watson says that 40 chains or half a mile is enough for *A. maculatus* breeding places in the Federated Malay States. With *A. culicifacies* as the main carrier we cannot lay down any such distance. We know of many instances where this carrier has certainly flown two miles, and it is suspected of having done much greater distances in a sparsely populated country, when in search of food.

(3) *The rate of invasion from outside*. Invasion from outside invariably takes place. In our own estates where every drop of water was carefully oiled over a large area, we were always able to trap a few *A. culicifacies* in the lines, which had come in from outside. They were not in sufficient numbers in any particular year to cause cases. In some places we have met with it is quite useless to spend money on oiling; we probably only prevented from hatching out some 5 to 10 per cent. of the total anopheline population of the estate, the other ninety per cent. came in from outside. It is only fair to state that these cases are not very numerous and nearly all possess the same general characteristics. There are none in the Periyar valley. In many Assam estates invasion from outside will be found a very serious factor.

(4) *The cyclic variation in the number of the carrier anopheles*. About this we do not propose to say much at present. It will be made the subject of a separate communication when all our researches are complete. Briefly we mean that one species of anopheles, like all other flying insects throughout the world, is subject to variation in numbers from year to year; it follows a definite cycle of approximately 6 to 8 years. The phenomenon has been observed over very large areas such as the whole of Ceylon, and in parts of Travancore in 1929-30. Consequently well-thought-out measures, which have yielded perfectly satisfactory results in the control of anopheles for 5 or 6 years, may entirely break down on the seventh.

From the above it is obvious that anti-anopheline measures, though absolutely necessary for success in most instances, require great care and constant scientific study in any given locality.

Turning now to anti-gametocyte measures, it must be admitted that the discovery of plasmoquine has put an entirely different complexion on this side of the problem. In the adult Tamil cooly it was formerly a practical impossibility to cure him of his gametocytes. The only way it could be done was a prolonged course of either quinine or cinchona febrifuge extending over 2 to 3 calendar months. No cooly will put up with the annoyance of this procedure. Indeed we can go further and say that very few Europeans would persevere sufficiently long with the treatment; they would rather have an occasional attack of malaria than endure the remedy. With little children matters are easier. In the first place it is thoroughly well known that in a community it is usually the small children who are gametocyte carriers. On a tea or rubber estate the reason is easily understood. Children under 10 years earn no money, and consequently it is of small moment if they are ill. Should they contract malaria good parents will arrange for them to get some medicine; indifferent ones will not take the

trouble. Consequently it is not unusual to find in malarious districts anything from 30 to 60 per cent. of the children with parasites in their blood. On the other hand we have proved that they very soon lose their gametocytes, with proper treatment, even without the addition of plasmoquine. With the judicious use of euquinine, mixed with ordinary sweetened condensed milk, it is possible to establish a happy state of affairs among the children on any estate. Euquinine being tasteless, and small children all the world over being greatly attracted to such an excellent sweetmeat as sweetened condensed milk, it becomes easy for a decent dispenser or a native doctor to become so popular that whenever he appears with a bottle all the children in the lines run to him with their mouths open. In a few days, or at the outside in a week, every child on the estate looks out for "the milk." This may be given daily, or two or three times a week, according to circumstances of the case. In the five estates mentioned above, we commenced freeing the children of gametocytes in the middle of February. There was no probability of a large number of anopheles hatching out before the middle of March. The daily dose to every child on the estate rendered them free from gametocytes in their blood before the anopheles appeared. On the estates referred to this treatment was carried on throughout the whole malaria season until the break of the rains. So successful was it that the number of children who sickened with malaria was negligible. It is extraordinary how immune from all manner of disease these children kept under this treatment, even during a moderate outbreak among adults.

As regards anti-gametocyte work for adults, we consider the advent of plasmoquine to be the most important discovery since that made by Sir Ronald Ross of the life cycle of the parasite in the mosquito. We do not propose to quote a large number of authorities in support of the contention that plasmoquine has an action on the gametocytes of malaria. It is so well accepted a fact that it requires no discussion. As soon as this fact was established it was obvious, on mathematical grounds alone, that our position in the fight against malaria was greatly strengthened. We could now wage an anti-gametocyte campaign with some reasonable hope of success, exactly in the same way as the early pioneers commenced anti-larval campaigns. The method we adopted was very simple; we commenced as long ago as 1928. Recognising that plasmoquine was a little-known drug at this time and the necessity for care, we were guided in our choice of methods by the following considerations:—

(a) That the oriental, particularly the Tamil cooly, is much more susceptible to the influence of drugs than the European.

(b) That many of the best coolies on the

estates are girls and young married women whose weight is approximately 6 to 8 stones. It was obvious that small doses were indicated for these.

(c) Further it was very early recognised in Europe and other parts of the world that plasmoquine compound was a comparatively harmless mixture; any accidents that have occurred have been occasioned by the use of plasmoquine pure.

We therefore proceeded on the following lines:—In every patient who sickened with malaria, the treatment was divided into three stages as follows:—

*Stage 1.*—Whilst the patient is febrile. For this we have given either cinchona febrifuge tablets, or Major Sinton's alkalies and quinine treatment as the circumstances indicated. In the former case this consisted of a morning dose of 2 cinchona febrifuge tablets (each of gr. v.) and an evening dose of one cinchona febrifuge tablet and one tablet of plasmoquine co.; i.e., total for the week 105 grains of cinchona febrifuge and of 0.07 gramme of plasmoquine.

*Stage 2.*—(Second week). Two tonic pills a day.

*Stage 3.*—(Third week). Repeat the first week's treatment; total amount of quinine 210 grains, of plasmoquine in 14 doses, 0.14 gramme. This constitutes a three weeks' anti-gametocyte after-treatment. It will be observed that we only give one full dose of plasmoquine co. a day, instead of three as recommended by the makers. For Tamil coolies we find this treatment is invaluable, and we must have given in Ceylon and Southern India at least 100,000 doses and we have never had any complication of a serious nature.

The use of this anti-gametocyte treatment has another profound effect on the influence of health in a labour force. It practically does away with relapses. Everyone conversant with work on estates knows that, in a labour force of say 1,000 in a fairly unhealthy district, there will be something between 50 and 100 "confirmed relapsers," according to the time of the year. These are coolies who suffer from benign tertian malaria and mixed infections; they usually report sick with fever about once a month for 3 to 9 months consecutively. They are a source of considerable loss to the Company owing to inefficiency; they are also a danger to the community, because they are gametocyte carriers. Since the adoption of the anti-gametocyte after-treatment, confirmed relapses are very rare. We could probably do away with them altogether if larger doses of plasmoquine were given, but if this is necessary the patient is sent into the Group Hospital, where he is under observation. For children who are quartan gametocyte carriers, or indeed for any particularly badly infected lot of children, we add small doses of plasmoquine



(pure) to the "euquinine and milk" treatment on two days a week; the addition of plasmoquine does not turn the milk sour or make it any less palatable.

We maintain most emphatically that, with these two new weapons, viz., the anti-gametocyte after-treatment for adults, and the euquinine and milk treatment for children, it is possible to make such an onslaught on gametocyte carriers in a community which will give anything up to 90 to 95 per cent. of success. This fact we have proved by taking blood slides at various times; this will be referred to later on.

Acting on the principles laid down in the foregoing paragraphs, the actual standing orders for the anti-malarial campaign on these estates are as follows:—

*Measures against resting anopheles females.*

(1) During the winter months of December and January all Europeans', clerks', teamakers', and staffs' bungalows and all servants' quarters near the same are spring-cleaned and white-washed and sometimes fumigated with sulphur. This has prevented the outbreak of malaria, due to hibernating infected females in the neighbourhood of Europeans' and staffs' bungalows which occasionally broke out in the first week in March.

*Anti-gametocyte work.*

(2) In February all adults are inspected by either the junior writer himself, or the superintendent and the Indian doctor of the estate. All seedy, anæmic looking adults, whether men or women, and particularly new arrivals are put on to a separate list. The malaria register (designed by one of us) gives a list of all cases of malaria that have occurred during the past non-season; the people figuring in the book are specially examined—sometimes blood films are taken; all these unhealthy coolies are given the anti-gametocyte after-treatment as above at least once.

(3) On the 15th February all children on the estate are put on to a daily dose of euquinine and milk. Up to 1929 no exception was made; in 1930 malaria was so rare that only children with spleens and new-comers were treated.

*Anti-larval measures.*

(4) On the 1st March—or earlier if larvæ are caught in certain warm places on the estate—vigorous anti-larval measures commence; all breeding places are known to the superintendent, and the method of treating them is now thoroughly well known to Kanganies and coolies; oiling is vigorous and thorough; it is carried out weekly throughout the dry season.

(5) If anyone sickens with malaria, his blood film is taken and he is treated as above described.

Incidentally it will be observed that we are great believers in what we may term "the proper timing of measures in a campaign." It

is necessary to study the local conditions of an outbreak carefully and arrange to start measures so that the anopheline population *will never increase beyond the normal winter level*. If the first batch of anopheles that hatch out in the spring is allowed to get into the lines an enormous amount of damage may be done. Our experience on the Tungamullay outbreak confirms this opinion. Extraordinary activity after the event seems to produce very small results. Consequently, therefore, a campaign should be laid down always well ahead of the increase in the anopheline population, and dates must be rigidly adhered to. The writers could never make the Agents of another Company understand the importance of providing the necessary oils, etc., by a certain date; the result was that much of the expenditure was wasted and the results were very poor.

Some time in the early part of 1928 the knowledge of the efficiency of plasmoquine as a drug had advanced sufficiently far to make a test desirable. The subject of the "confirmed relapser" cooly had always been very prominent in our minds, principally because he was such a nuisance, and a definite attempt was made to see whether the new preparation would be of value in doing away with this important source of ill-health and loss.

Before putting our new ideas into practice it was thought desirable to have some definite idea as to the number and kind of parasites that these confirmed relapsers usually harboured. Consequently in 1928 an order was issued by the Manager of the Travancore Tea Company to take blood slides of all coolies on the estates who were known to have relapsed three or four times since the last malarial season which ended with June 1928.

The malarial register kept on these estates rendered this piece of work very easy. As a result of these orders 95 coolies on the estates, who were known to have had relapses were called to the dispensary and the ordinary thick blood films were made from their blood. At the time many of the coolies were not ill. Some were doing an ordinary day's work, but in most cases they were not in a good state of health. On arrival these slides were all stained with Giemsa's stain and examined by one of us. The results are very interesting.

(1) Forty-five per cent. had no parasites at all in their blood.

(2) In about 20 per cent. the corpuscles showed malignant stippling, a shotty appearance, and stained deeply blue.

(3) The results of the remaining 35 per cent. are given in the table. It will be observed that benign tertian largely predominated, as one would expect.

(4) Dividing the parasite carriers into (1) those who had young forms (that is developmental forms, etc.), and (2) those who had gametocytes or both, we find that 41 out of

TABLE II.

Analysis of parasites in "confirmed relapsers," Travancore Tea Estates Co.'s estates.  
August 1928.

Estates.	Total number of slides.	No plasmodia found and no other evidence of malaria in the blood.	Number without plasmodia but with other evidence of malaria.	Number with parasites.	Young forms only (rings, schizonts, developed forms).	Old forms only (gametes and crescents).	Number with both old and young forms.	Benign tertian.	Malignant tertian.	Quartan.	Mixed (B. T. and M. T.).
Tungamullay ..	18	3	2	13	4	2	7	8	3	..	2
Injikadu ..	13	4	2	7	1	5	1	7	..	..	..
Pasumullay ..	21	5	8	8	4	3	1	7	1	..	..
Mount and Savari	6	2	..	4	..	1	3	3	..	..	1
Pambanar ..	14	3	6	5	..	2	3	4	..	..	1
Nellikai ..	8	..	6	2	..	2	..	1	1	..	..
Munjamullay ..	15	2	..	13	2	10	1	7	5	..	1
TOTAL ..	95	19	24	52	11	25	16	37	10	..	5

52 or approximately 80 per cent. of the positive slides showed the presence of gametocytes. This we consider is a very important finding.

The figures demonstrate beyond any doubt the danger to the community which these people give rise to; even though just at that time little harm was done, anopheles were very rare, and the climate cold. Practically all these confirmed relapsers were adults. It should also be borne in mind that a very thorough campaign of anti-malarial measures and treatment of children (though no plasmoquine treatment was then in use) had been in operation during the previous malaria season between March and June of 1928.

During the succeeding months of the autumn

of 1928, viz., September, October, November and December every person on the estates who sickened with fever had his blood taken before his treatment was commenced. At this time the plasmoquine after-treatment was taken into use for the first time, but the important point to remember is that during the previous malarial season or the season of maximum activity March to June of the same year (1928) no plasmoquine treatment was in use. During the autumn 243 slides were sent to us from various estates. These were of course mostly from cases of relapse, reinfections being rare on account of the cold. The results are given below in tabular form, Tables III and IIIa. One or two points are noteworthy.

TABLE III.

Travancore Tea Estates Company, Limited.  
Blood films, Autumn 1928, pre-plasmoquine period.

Estates.	Total slides.	Negative.	Positive.	B. T.	M. T.	Mix.	Qu.	Gametocytes.	Percentage of positive.
Munjamullay ..	83	11	72	28	25	19	..	30	87
Tungamullay ..	28	8	20	16	2	2	..	13	71
Injikadu ..	15	6	9	8	1	..	..	3	60
Nellikai ..	54	14	40	23	12	4	1	13	74
Pambanar ..	4	..	4	4	..	..	..	..	100
Cranby ..	5	5	..	..	..	..	..	..	Nil.
Mount ..	5	2	3	1	1	..	1	1	60
Pasumullay ..	45	17	28	22	3	3	..	23	62
Thengakal ..	4	3	1	..	1	..	..	..	25
	243	66	177	102	45	28	2	83	..

Seventy-three per cent. of all slides positive. Thirty-four per cent. of all slides with gametocytes. Fifty-one per cent. of all positive slides contained gametocytes.

- (1) The great prevalence of benign tertian infections.
- (2) The high relative frequency of mixed infections. (From long experience of mixed

Altogether there were 235 slides sent from 10 estates. The results are most striking. The cold weather slides numbering 120 only produced 8, or 7 per cent. of positives. Amongst

TABLE IIIa.  
Travancore Tea Estates Company, Limited.  
Blood films, Autumn 1928, pre-plasmoquine period.

Month.		Total slides.	Negative.	Positive.	B. T.	M. T.	Qu.	Mix.	Gameto-cytes.	Per-centage of positive.
September	.. ..	45	13	32	17	12	1	2	16	71
October	.. ..	84	23	61	37	14	..	10	24	73
November	.. ..	91	23	68	36	15	1	16	34	75
December	.. ..	23	7	16	12	3	..	1	9	70
		243	66	177	102	44	2	29	83	..

infections, we are of opinion that these cases are particularly difficult to cure. The two varieties of parasites appear to assist each other in keeping alive.)

(3) The percentage of positive slides is about 73, and the percentage of gametocyte carriers in the whole 243 slides is 34 per cent. and 52 per cent. of all positive slides.

In the autumn of 1929 and the spring of 1930 an exactly similar research was carried out on the estates, but during the latter part of 1928 and the whole of 1929 including the fever season, the standard anti-gametocyte after-treatment was administered. Every patient who sickened, and all seedy, anæmic unhealthy looking adults, who were new-comers, received it. The results are given below in Tables IV and IVa.

these there was not a single case which contained matured gametocytes. They were all benign tertian infections. The progressive decline in the percentage of positives month by month should also be noted.

There is, however, an objectionable feature in the figures. No September and October figures are given. Unfortunately the work was only commenced in November. There is no doubt that had September and October figures been available during this year, the percentage of positive slides would have been increased because these slides would be nearer the previous active malarial season. Now compare the two Tables III, IIIa and IV, IVa. Note the drop in the percentage of positive slides from 73 per cent. to 8 per cent. and in the number of gametocytes from 34 per cent. to

TABLE IV.  
Travancore Tea Estates Company, Limited.  
November 1929 to June 1930, post-plasmoquine period (after-treatment given for a year).

Estates.	Total slides.	Negative.	Positive.	B. T.	M. T.	Mix.	Gameto-cytes.	Percentage of positive.
Munjamul-lay.	64	45	19	7	11	1	0	30
Tungamul-lay.	114	86	28	14	14	0	4	25
Injikadu	17	10	7	0	7	0	Nil	41
Nellikai ..	15	10	5	0	5	0	1	33
Pambanar	3	3	0	0	0	0	Nil	Nil.
Arnakal ..	6	5	1	1	0	0	Nil	16
Cranby ..	2	2	0	0	0	0	Nil	Nil.
Mount ..	7	7	0	0	0	0	Nil	Nil.
Pasumullay	3	2	1	1	0	0	Nil	33
Thengakal	4	2	2	1	1	0	Nil	50
235		172	63	24	38	1	..	..

TABLE IVa.

*Travancore Tea Estates Company, Limited.**Blood films, November 1929 to June 1930, post-plasmoquine period (after-treatment given for a year).*

Month.	Total slides.	Negative.	Positive.	B. T.	M. T.	Mix.	Gameto-cytes.	Percentage of positive.
November	25	21	4	4	0	0	0	16
December	11	9	2	2	0	0	0	18
January ..	76	74	2	2	0	0	0	3
February	1	1	0	0	0	0	0	0
March ..	7	7	0	0	0	0	0	0
April ..	23	11	12	4	7	1	3	52
May ..	47	23	24	17	7	0	1	52
June ..	46	26	20	14	6	0	1	44

	Slides.	Positive.	Negative.	Gameto-cytes.	Percentage of positive.
Non-malaria season.	120	8	112	0	7
Malaria season	116	56	60	5	51

*nil*; this is very striking even making due allowance for the fact that the figures are not quite comparable as regards time of year. There can be no doubt whatever that this improvement in the number of relapses, and in the number of gametocyte carriers is directly due to our anti-gametocyte after-treatment, because all the natural conditions in the two years' experiments are identical. The number of people is about the same, about 9,000 souls; they occupy the same lines on the same estates; in both years (1928 and 1929) anti-larval work took place during the malarial season with equal vigour and with good results in both cases, the only difference being that in 1929 our plasmoquine after-treatment had been in regular use about 12 months, and in 1928 it had not.

We consider that these figures are of great importance and establish beyond all reasonable doubt two things (if it were necessary):—

(1) The efficacy of plasmoquine compound in removing gametocytes from the blood of patients, in preventing relapses; in other words in curing the patients completely.

(2) The great influence that this gametocyte removal—when done systematically—has on the incidence of the disease in any community.

In 1930 malaria practically ceased to exist, so much so that the regular prophylactic dosing of all children was discontinued.

During the malaria season of 1930, three estates, A, B, and C, had the following number of cases during March, April, May, June and July. Vigorous anti-malarial measures were carried out on all, but no plasmoquine co. was administered.

## NO AFTER-TREATMENT.

Estates.	Number of cases.	Population.	Number of cases per 100 coolies.
A	239 *	820	29
B	84	740	11
C	166	950	18

\* 48 serious cases.

Five Travancore Tea Company's estates gave the following results, the latter had used the plasmoquine after-treatment steadily for two seasons.

## USED AFTER-TREATMENT.\*

Estates.	Number of cases.	Population.	Number of cases per 100 coolies.
Pasumullay	20	650	3
Injikadu	16	475	3
Nellikai	61	700	9
Munjamullay	44	850	5
Tungamullay	38	450	9

\* The blood film work shows that only 50 per cent. of these cases were true malaria during the period.

The discussion of the subject of the utility of plasmoquine would not be complete without mention of the work by Barber in the United States of America. He has shown that a ridiculously small dose of plasmoquine prevents the infection of anopheles. The drug appears to completely upset the fertility of the gametocytes and prevents conjugation. The doses we made use of throughout were one-third of what the makers prescribe for malarial patients. The reason for this reduction has been given

fully above. Therefore it follows that the results obtained by us act as a confirmation of Barber's work. Of course, his doses were very small, namely two doses a week. We

give seven doses a week, then an interval of a week, then another seven doses. We understand that Barber's work has been definitely confirmed in India.

TABLE V.

*Travancore Tea Estates Company, Limited.  
Anti-malarial campaign, season 1929-30.*

	OIL.			EUQUININE.			CONDENSED MILK.			LABOUR AND SUNDRIES.			TOTAL.			Number of children treated.
	Gals.	Rs.	As. P.	Ozs.	Rs.	As. P.	Tins.	Rs.	As. P.	Coolies.	Rs.	As. P.	Rs.	As. P.		
Munjamul-lay.	756	716	10 0	84	157	8 0	192	111	0 0	184	95	8 0	1,080	10 0		161
Injikadu	1,212	1,291	10 5	43	74	6 6	108	63	12 9	375	227	4 0	1,657	1 8		257
Nellikai	768	552	0 0	37	69	14 5	125	72	4 3	126	66	0 6	760	3 2		186
Pasumullay	413	416	0 6	58	108	12 0	103	60	6 9	31½	14	3 10	599	7 1		138
Tungamul-lay.	1,608	1,163	0 7	64	120	0 0	112	63	12 6	458	464	8 11	1,811	6 0		63
	4,757	4,139	5 6	286	530	8 11	640	371	4 3	1,174½	867	9 3	5,908	11 11		805

## Abstract.

		Rs. As. P.
Oil 475 gallons	.. ..	4,139 5 6
Euquinine 286 ozs.	.. ..	530 8 11
Condensed milk 649 tins	.. ..	371 4 3
Sundries	.. ..	867 9 3

		Rs. As. P.
Munjamullay	.. ..	1,080 10 0
Injikadu	.. ..	1,657 1 8
Nellikai	.. ..	760 3 2
Pasumullay	.. ..	599 7 1
Tungamullay	.. ..	1,811 6 0

TOTAL .. 5,908 11 11

TOTAL .. 5,908 11 11

TABLE VI.

*Qualities of crude oil, kerosene oil, euquinine and condensed milk used for each estate and value of same, 1927.*

	Crude oil. Gallons.	Kerosene oil. Gallons.	Euquinine. Lbs. Ozs.	Condensed milk. Tins.
Munjamullay	280	200	5 1	277
Tungamullay	70	140	4 9	84
Pasumullay	3	6	1 1	92
Nellikai	120	120	7 6 7	386½
Injikadu	80	160	4 11	165
	553	626	22 12 7	1,004½

	Crude oil.	Kerosene oil.	Transport.	Euquinine.	Milk.	Total.
	Rs. As. P.	Rs. As. P.	Rs. As. P.	Rs. As. P.	Rs. As. P.	Rs. As. P.
Munjamullay	81 10 8	168 12 0	83 7 7	227 13 0	173 2 0	734 13 3
Tungamullay	20 6 8	118 2 0	46 2 11	210 15 0	52 8 0	448 2 7
Pasumullay	0 14 0	5 1 0	2 0 0	46 13 0	57 8 0	112 4 0
Nellikai	35 0 0	101 4 0	45 6 8	333 4 6	241 9 0	756 8 2
Injikadu	23 5 4	135 0 0	52 12 5	210 15 0	103 12 0	525 12 9
	161 4 8	528 3 0	229 13 7	1,029 12 6	628 7 0	2,577 8 9

GRAND TOTAL Rs. 2,577 8 9

Transport calculated at 33.3 per cent.

No report on sanitary measures is really complete without some idea of cost. Therefore we append two tables giving the amount of money expended on the estates which we have treated. The figures in themselves are interesting and may be useful as a basis of comparison with the work of other sanitarians.

Before concluding this note we wish to express our indebtedness to Mr. E. C. Sylvester, the Manager of the Travancore Tea Estates Company in Travancore, for much kind assistance. Any request which we had to make was always met with a ready response and we consider that the success of the measures is to a large extent due to the fact that he has so thoroughly entered into the spirit of the work.

Also to Mr. Cantlay, the Superintendent of Munjamullay, and his wife, we wish to pay a tribute to their keenness and efficiency. The medical arrangements on Munjamullay are the best we have seen in very many years' experience.

#### *Summary and conclusions.*

(1) From mathematical reasoning, the only correct way of preventing reinfection in malaria is to reduce the number of anopheles and the number of gametocyte carriers at the same time.

(2) In order to do this, anti-larval measures must commence at the correct moment, the object being to keep the anopheline population down to the normal cold weather level.

(3) Anti-gametocyte operations should precede by approximately a month anti-larval measures.

(4) Euquinine and milk, with or without a little plasmoquine, is the best treatment for removing gametocytes from children.

(5) Suitable doses of plasmoquine compound given as an after-treatment in recovered cases of malaria will greatly reduce the number of gametocyte carriers in any labour force.

If this is not adequate, small doses, two per week, of plasmoquine and quinine given to adults will assist in preventing the disease, by rendering the gametocytes inactive. This fact was originally discovered by Barber in America.

(6) In all highly infected areas anti-larval measures will be necessary for several years. Whether they can eventually be done away with is doubtful, and will depend on the efficiency of the anti-gametocyte treatment.

(7) Anti-gametocyte campaigns are easily carried out and very successful on estates, but present great difficulties among the civil population.

### THE TREATMENT OF ORIENTAL SORE WITH BERBERINE ACID SULPHATE.

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of Tropical Medicine and Hygiene.

In a previous publication (Das Gupta and Dikshit, 1929) we showed that berberine acid

sulphate inhibits the growth of *Leishmania tropica* even in as high a dilution as 1:80,000, and that it is only slightly irritant to the tissues, causing dilatation of the vessels in the neighbourhood of the injection, followed by simple oedema; it does not cause necrosis of the tissues.

During 1928-29 we treated 6 cases of oriental sore successfully with a 2 per cent. solution of berberine acid sulphate, two to four injections being required to effect a cure.

In order to see whether it would be possible to cure an oriental sore with only one intensive dose of berberine acid sulphate, a suitable patient with 4 lesions on his person was selected.



Fig. 1.—Photograph to show lesions 1 and 2 before treatment.

*History of the case.*—The patient is a healthy young Bengali, who had never been out of Calcutta until two years ago when he went on pilgrimage to Hardwar in the United Provinces, and stayed there 32 days. Six months ago, i.e., 1½ years after his return from Hardwar, he noticed a small papule on the abdomen. When he presented himself for treatment, he showed the following lesions:—

(i) A non-ulcerating nodule, about the size of an 8 anna bit, on the abdomen.

(ii) A similar growth, slightly smaller however, and surrounded by a hyperæmic area about ¼ inch in diameter around the nodule, on the right arm.



(iii) An ulcer with raised margin, covered with a yellow slough, about  $1\frac{1}{4}$  inches in diameter, on the right wrist.

(iv) A small nodule on the right scapular region.

*Laboratory findings.*—Smears from lesions 1, 2, and 4 showed leishmania in large numbers, whilst cultures taken from all four lesions gave rich growths. In the case of the first and second lesions, material was also obtained by puncturing with a stout needle the hyperæmic area about  $\frac{1}{4}$  inch away from the margin of the nodule; this gave a scanty positive growth at the end of a week. This shows that the parasites are not limited to the nodule itself, but are present in small numbers in the adjacent tissues around the sore.



Fig. 2.—Photograph showing the effect of treatment.

*Treatment.*—Lesion 1 together with the tissue around it was infiltrated on all sides by an injection of 3 c.c. of Orisol (the trade name for 2 per cent. berberine acid sulphate solution, prepared by Messrs. May and Baker, London, and put up in ampoule form). Lesions 2 and 3 were each treated with one infiltration with 3 c.c. Lesion 4 only required 1 c.c. for thorough infiltration.

Under local anaesthesia small bits of tissue were removed from lesion 1 (a) before treatment; (b) 45 hours after the infiltration; and (c) 4 days after the infiltration. Sections were cut and stained and the appearances found are shown in Figs. 3, 4 and 5. Fig. 3

shows the appearances before treatment; it will be seen that the endothelial cells are loaded with leishmania. At 45 hours after treatment very scanty parasites only are left

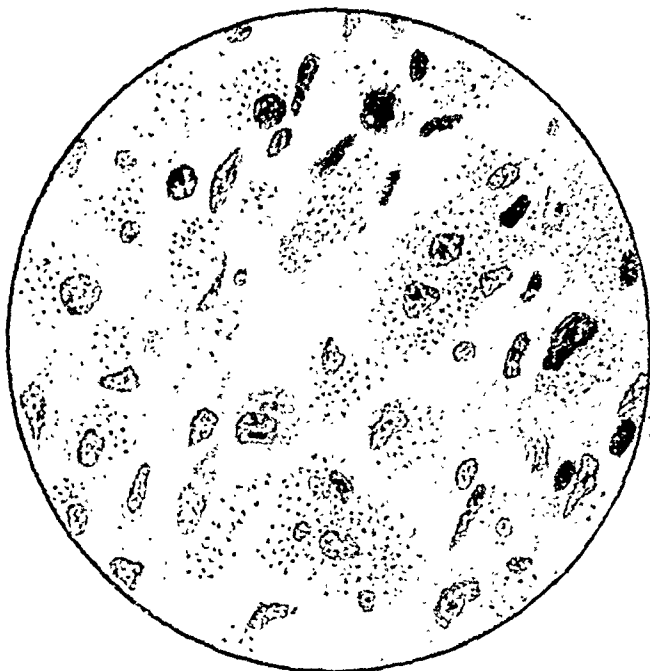


Fig. 3.—A section of the nodule (lesion 1) before treatment to illustrate the massive infection.

(Fig. 4), and on the fourth day after treatment (Fig. 5) the lesion is almost free from parasites. In order to destroy the few remaining parasites a second infiltration with 2 c.c. was given into lesion 1.

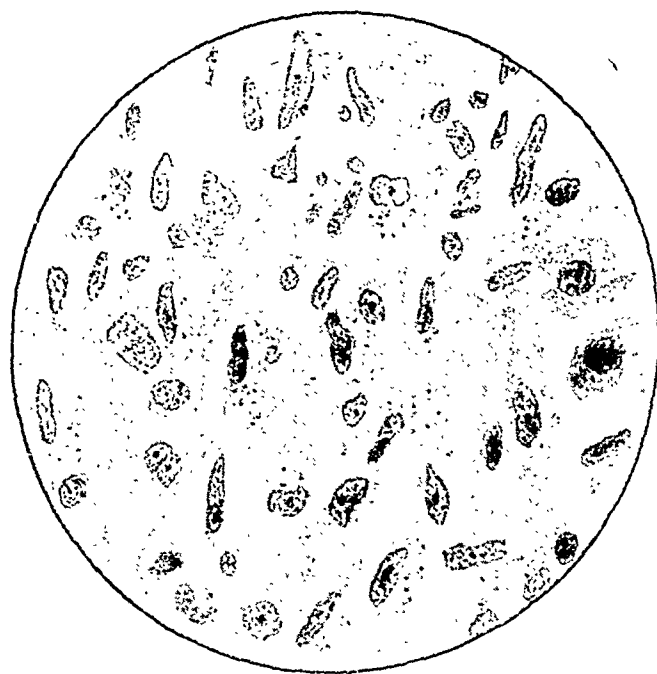


Fig. 4.—A section of the same lesion 45 hours after an injection of 3 c.c. of 2 per cent. berberine acid sulphate.

The patient noticed a slightly painful swelling at the sites of injection the day after treatment, but this rapidly subsided with hot saline compresses. Beyond this no discomfort was felt. All four lesions healed very rapidly, as will be seen from the photographs (Fig. 2).

*Discussion.*—Napier (1929) treated 10 cases of oriental sore by injections of 1 per cent. solution of berberine acid sulphate, and reported that 5 or 6 injections were required for a cure.

So far I have seen 33 cases of oriental sore (including 5 cases seen at Bannu, N. W. F., when on field service). In none of them were more than a dozen lesions present, all of them sufficiently small in area to be dealt with by local infiltration with berberine acid sulphate. There are certain points to which attention must be paid, however. A 2 per cent. solution of the acid salt must be used; the hyperæmic area around the sore must be infiltrated as well as the actual lesion itself; and sufficient solution must be injected. The dose given—2 c.c. or 3 c.c.—must be injected into

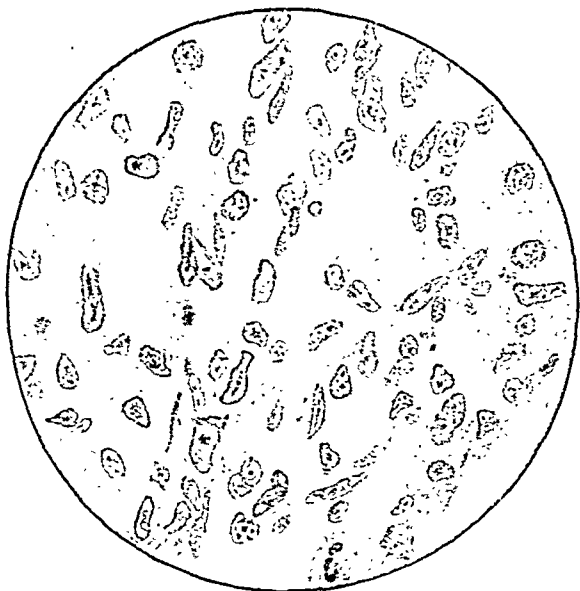


Fig. 5.—Section taken on the 4th day after injection.

several points, so as to thoroughly infiltrate the area. If attention is paid to these details, the majority of oriental sores can be cured by a single injection.

In the case of dermal leishmanoid (due to *L. donovani*) where the lesions are often diffuse and numerous, of course berberine is not of much practical use; here treatment by intravenous injections of Neostibosan is indicated.

#### Remarks.

1. As the parasites are present in the apparently healthy tissues in the neighbourhood of the lesion, this tissue, as well as the lesion itself, must be infiltrated.

2. A sore of moderate size, about 1 inch in diameter, can be cured by infiltration with a single dose of 3 c.c. of 2 per cent. berberine acid sulphate. A sore involving a larger area may require a second injection on the fourth or fifth day.

3. Local reaction, even after a dose of 3 c.c., consists only of transitory swelling and pain, and yields readily to fomentations.

4. Unless the lesions are very numerous—a condition which is very uncommon in the author's experience—oriental sore should be treated by local infiltration with berberine acid sulphate solution rather than by intravenous injection of antimony compounds.

#### Acknowledgments.

I wish to express my thanks to my chief, Lieut.-Col. R. Knowles, I.M.S., for his help and advice; also to Dr. D. Panja of the Department of Dermatology of the School for preparation of the sections; and also to Mr. H. M. Roy, artist of the Calcutta School of Tropical Medicine, for the preparation of Figs. 3, 4 and 5.

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### THE CAUSATION OF CANCER.\*

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 (N. India).

*Heredity.*—Statistical enquiries by Karl Pearson, based on 3,000 cases of cancer, and the investigations of Bashford, Harrison Cripps, Ogle and various insurance companies seem to show that, contrary to popular impressions, there is no evidence that this terrible disease is actually inherited. Is there, nevertheless, an inherited predisposition as in the case of tuberculosis and leprosy? Experimentally, the existence of such a predisposition, in mice, has been established by observations on 390 cases.

*Diet.*—The influence of diet is important. In rats and mice it has been shown that the susceptibility to tumour grafts, and their rate of growth, or even their arrest, to some extent, can be controlled by diet.

The comparative infrequency of malignant disease of the alimentary system in India is noteworthy. Even in a large city like Lahore, malignant disease of the stomach may be less than 0.1 per cent. of cancerous tumours. On a report from India, sent to the Imperial Cancer Research Fund, of 1,589 cases of carcinoma, less than 5 per cent. were of internal organs. The characteristic of the diet of India, as a whole, is that it is often vegetarian and apt to be low in proteids. Does undue consumption of animal food tend to alter the balance of internal secretions in the human body? Under diet, the effect of alcoholic excess has to be

\* Being a paper read at the Medical and Veterinary Research Section of the Indian Science Congress, Allahabad, January 1930.

considered. Snow, Victor Horsley and some German investigators consider that there is evidence that the chronic irritation produced by alcohol is a factor in cancer formation.

These then are certain general considerations, from which we may infer that there may be an hereditary predisposition, that diet may and probably does affect the development and growth of cancer and that alcohol in excess, especially if undiluted, may be a factor.

*Parasitic origin.*—But what is cancer? Is it a parasitic disease, associated with, or caused by, micro-organisms? We have heard of cancer houses and of low-lying districts in river valleys in which the disease is supposed to be endemic. Law Webb and Green are protagonists of a theory of infection based on this. But we must remember that between 7 and 10 per cent. of those who are over 40 years of age die of cancer, so fallacy may very easily arise. Bashford, as the result of a careful study of five alleged instances of cancer houses, was unconvinced. Indeed, that one infection should at one time produce carcinoma, at another time sarcoma, and at still another rodent ulcer seems improbable.

The difficulty in assuming a specific parasitic infection in the case of cancer is a very real one from a pathological standpoint. For in cancer and sarcoma we are familiar with primary and secondary growths the latter reproducing the structure of the former. How can this be harmonized with any theory of either one parasite for all forms, or specific parasites for each form of malignant disease? The difficulty is accentuated by the fact that tumours cannot be grafted from an animal of one species into that of another. That they can be grafted into the same species is of course well known, as is also the fact that cells of grafted tumours are derived entirely from the cells of the graft.

In man, very occasionally, an accidental graft occurs on to a contiguous opposing surface. The evidence of communication from husband to wife is very slender.

Up to this point, and with only these facts, the case for the parasitic origin of cancer is very weak. It received however a sharp stimulus from the researches of Gye and Barnard(1). It will be remembered that they showed the filterability of elements of the "Rous" tumour, and proved that filtered extracts were robbed of their activity by heating to 55°C. for 15 minutes, or by the use of antiseptics. The essential and interesting discovery which they made was that the element destroyed by heat is not the same as that destroyed by antiseptics. For while either alone was incapable of producing tumour formation, the two inactive fluids mixed together acquired the power of starting a tumour. They claimed, therefore, that "the agent is a living-filterable microbe and that it is the cause of the new growth."

These experiments related to a spindle-celled sarcoma in fowls. The research was interesting and of value in showing the conditions under which one form of new growth may be propagated. It is perhaps the strongest evidence which has yet been adduced that under certain conditions a neoplasm may be provoked by a filterable micro-organism.

*Irritation.*—If however there is one fact about cancer, more fully established than any other, it is that it is caused by irritation.

The effect of different rays from the spectrum is notable. Radio-activity may be very irritating—the gamma rays of radium, X-rays and infra-red or heat rays—all are capable of exciting cancer. Epithelioma of the leg from constant contact with hot water pipes, and of the lip or tongue from the heat of a clay pipe or cigarette are cases in point.

There is no more striking illustration of the cancer producing effect of heat, than the Kashmiri Kangri-burn epithelioma(2). The essential cause of this disease is the constant irritation of intense heat from the Kangri. This is an earthenware bowl, six or more inches in diameter, surrounded by basket-work and surmounted by a wicker handle. This, which is heated by charcoal, is carried by the poorer class of Kashmiri against the skin, under a single garment not unlike a smock frock. The temperature to which the skin is exposed may exceed 150°F. and it is this heat which is undoubtedly the primary factor in the causation of the cancer. The charcoal is prepared from the leaves and twigs of the plane, willow, witch-hazel and more rarely pine—the latter is seldom used, because it is smoky. Volatile substances, products of combustion, may possibly play a secondary part. During the past fifty years more than 2,650 operations for epithelioma have been performed in the Kashmir Mission Hospital and of these approximately 80 per cent. were for Kangri-burn cancer. Thus, year by year, we have had the production of cancer, from one particular cause, going on under observation. The seats of election of these growths are the inner aspects of the thighs and the anterior surface of the abdomen, above or below the umbilicus. Sooner or later secondary growths occur in the lymph glands of the groin and axilla.

The effect of chemical irritants has long been recognised. The danger of repeated applications of nitrate of silver to papillomata is common knowledge. Yet it is a powerful antiseptic. One of the best known irritants, tar, which has been used so largely in experimental work on rats and mice, has almost a specific effect in the induction of cancer when repeatedly applied to the skin. Certain trades and occupations are associated with a special liability to cancer production. Such are gas works, and factories dealing with paraffin, rubber, lead, tinplate, and furs. In the last

four of these sulphur or sulphurous acid are used at some stage or another, and this may be the irritant. Chimney sweep's and cotton spinner's cancer are well known. Betel chewing in India and its association with cancer is another illustration of chemical irritation. Berenblum, in experimental work, has found that, in certain conditions, repeated mild freezing with carbon dioxide snow is capable of inducing malignant tumours.

The report of Prof. R. D. Passey of Leeds(3) on research work in the production of hyperplasia is interesting and relevant. The effect of an intrapleural injection of an emulsion of olive oil and bile salts causes cell proliferation. He points out that groups of electrolytes possessing monovalent, bivalent and trivalent cations respectively produce increasing manifestations of cellular proliferation as the valency of the cation increases. He also quotes Shaw's experiments which show that although a relatively weak solution of common salt exhibited in distilled water produces no gross reaction, it becomes highly effective in the production of hyperplasia when it is added to an acid "buffer" solution which is of itself ineffective. This may prove to have some bearing on Gye and Barnard's work.

But beside physical and chemical irritants, perhaps the most important of all are vital irritants. Intermediate are the whole group of toxins arising from faulty metabolism or delayed elimination. Arbuthnot Lane(4) in this connection emphasises the danger of chronic intestinal stasis as a cause of cancer of the sigmoid flexure and rectum. Here we not only have continued mechanical irritation but also doubtless the generation of irritating toxins.

There is a further large group of cancers which arise in glandular acini—those of other parts of the alimentary canal, and those of the breast, etc. We know that the beginning of these is usually an accumulation of secretion of cells or waste products in the acini, with blocking of ducts, leading to bursting of limiting membrane and infiltration. Is there not here also a probability of local irritation, possibly augmented by some faulty metabolism? The incidence in elderly people seems to favour the idea that there is loss of balance between the action of certain endocrines.

This brings us to the limit of our knowledge.

What is the method of control and limitation of growth in the human body? If we apply skin grafts to a wound, the cells multiply until the wound is covered in and then they cease to multiply. Why? Why does a gland graft survive but not increase, whereas a malignant tumour graft grows and increases? The germ plasm of the embryo is made up of particles which have dissimilar rôles in building up the organism. The nucleus of a malignant tumour is different, as there is only active

reproduction of the same type without differentiation. This activity must depend on the supply of nourishment, and that again must be largely influenced by internal secretions. The action of the pituitary body, of the adrenals, the thyroid and thymus are all understood to some extent. We know quite enough about them to realise the profound influence which they exercise on nutrition and growth. The effect of the internal secretion of the ovary on cancer, is also remarkable. Those secretions are under the control of the nervous system, but they probably act directly on the tissues.

#### Summary.

1. The cause of cancer is irritation, physical, chemical or vital.

2. This irritation releases tissue from ordinary growth control, and it thus acquires intensive, intrinsic powers of multiplication.

3. This growth control is, to a large extent, exercised by endocrines which influence the nutrition of the growing cells.

4. Endocrines can themselves be influenced by diet.

5. There is no definite evidence that there is a specific cancer parasite. The difficulty of assuming the existence of multiple *specific* cancer parasites appears insuperable. But the irritation of toxins produced by micro-organisms may sometimes act as an excitant.

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### SYPHILIS IN MADRAS.

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THIS article is an attempt at a statistical review of cases of syphilis examined, diagnosed and treated at the Venereal Department of the General Hospital, Madras, during the first half of the current year. There is no pretension to anything original in it and it is not claimed to be a comprehensive survey of the disease.

The total number of cases seen is 857 of which 690 are males, 152 females and 15 children. For purposes of classification the cases are sorted out and the annexed table gives the number of cases in each division.

Sex.	Sero-neg- ative primary syphilis.	Sero-posi- tive primary syphilis.	Early secondary syphilis.	Late, secondary, recurrent and tertiary syphilis.	Latent syphilis.	Neuro- syphilis.	Congenital syphilis.
Males ..	88	58	301	169	55	16	3
Females ..	3	8	66	48	20	2	5
Children ..	..	1	..	..	..	..	14

### Primary syphilis.

Total number 157; males 146, females 11. Every case of sore on the genitals is subjected to three consecutive dark-ground, examinations: 107 cases were positive on dark-ground diagnosis, giving nearly 68 per cent. The following table gives an idea of the relation between the dark-ground and Wassermann diagnoses.

	D. G. positive. W. R. negative.	D. G. positive. W. R. positive.	D. G. negative. W. R. positive.
Males ..	88	16	42
Females ..	2	1	8

*Note.*—D. G. means dark-ground microscopic examination for *Spirochæta pallida*. The term, sero-positive primary syphilis, is not strictly correct, as, when once the blood shows evidence of infection, it is no longer local or primary.

Nearly 58 per cent. of the total number of cases of primary syphilis were sero-negative, the diagnosis resting on the dark-ground examination. We have rarely seen cases of papulo-erosive chancres; most of the cases were of the ulcerative variety. No case of extra-genital chancre was seen. The youngest age at which a chancre appeared was in a boy 8 years old, and the oldest was in a man 60 years old. The percentage of dark-ground positives does not compare very unfavourably with those of European and American clinics. As is well known, the chances of finding the *Spirochæta pallida* decrease with the age of the chancre, the previous application of antiseptics and caustics, and the complication of a banal infection. A few cases had received one or two injections of arsenic before they attended the clinic. To secure a much greater percentage of positives, the public should be educated to understand that they should seek expert medical aid on the very first appearance of a sore or papule after exposure. Medical students and general practitioners should be impressed with the fact that the early, rapid and certain diagnosis of primary syphilis is no longer a clinical, but, a laboratory problem. Every sore or abrasion or pimple in the genital region should be regarded as syphilitic till it is proved to be the contrary by repeated dark-ground examinations and a follow up serological test for a period of at least four months from the

time of exposure. As Stokes so tersely puts it, "the diagnosis of chancre is a matter of 10 minutes, whereas the diagnosis of chancreoid is a matter of 4 months." From the point of view of ultimate cure, sero-negative primary syphilis offers the best hope.

### Early secondary syphilis.

Total number of cases—369.

Males ..	302
Females ..	66
Children ..	1

The positive Wassermann percentage is given below.

	Both un- treated and treated cases.	Untreated cases alone.	D. G. positive. W. R. negative.
Males ..	Per cent. 86	Per cent. 89	2 cases
Females ..	89	91	1 case

It is the opinion of syphilologists who are well qualified to judge that the percentage of serological positives in early untreated syphilis should be as high as 98 per cent., but our figures fall below this standard. For purposes of diagnosis and treatment, cases of weakly positive and weakly positive but doubtful are disregarded unless there is clinically a fair margin of suspicion. In such cases, as far as possible, the provocative test is applied and the blood is again taken for examination. There were only 4 such cases in which the test revealed a strong positive reaction.

The Wassermann positive percentage of late, secondary, recurrent, and tertiary syphilis is as follows:—

Total number of cases ..	217
Males ..	169
Females ..	48

	Both treated and untreated cases.	Untreated cases.
Males ..	Per cent. 79	Per cent. 82
Females ..	81	85½

A clinical survey of cases of both early and late syphilis revealed the following characteristics:—

(1) The fourfold association of sore or scar in the genital region, enlarged lymphatic glands, cutaneous rash, and pains in all the joints and bones was seen in more than two-thirds of the cases of early secondary syphilis.

(2) The combination of scar, rash and osseous lesions was seen in a large number of cases of late syphilis.

(3) The comparative infrequency of mucous membrane lesions, and of palmar-plantar syphilides, forming only 4 per cent., as contrasted with 28 per cent. of cutaneous syphilides.

(4) A fairly good number of cases with osseous lesions—(8 per cent. in males and 14 per cent. in females). The lesions varied from early periostitis to gummatous osteitis and necrosis. The bones affected in order of frequency were the tibia, hard palate and bones of the face, femur, skull, ulna, ribs and sternum. A fifth of the cases showed multiple lesions involving more than one bone.

(5) There were 24 cases with joint swellings, usually bilateral, and in 20 per cent. of the cases polyarthritic. The joints affected were the knee, ankle, vertebral joints, shoulder and wrist in order of frequency. In a few cases the joint lesions were unilateral and very acute, suggestive of gonorrhœal arthritis, but no evidence of gonorrhœa could be discovered and the therapeutic response to arsenic was dramatic.

(6) The most common form of cutaneous rash was the maculo-papular syphilide or the papular syphilide. The annular type of syphilide was seen more frequently as scattered lesions having a predilection for the posterior surface of the scrotum, nape of the neck, and forehead near the hair margin. The destructive ulcerating forms of syphilide, rupia, nodular cutaneous syphilide and gummata were seen in nearly 7 per cent. of the cases.

(7) There were five cases of syphilitic iritis and 8 cases of bilateral epididymitis. Only two cases of gumma of the testis were seen.

#### *Latent syphilis.*

These formed an interesting group of 75 cases (55 males and 20 females) in which there was no direct clinical evidence of syphilis. The conditions for which they were examined are classified as under:—

##### *Males.—*

Discharge only, 31 cases (gonococci positive in 23).	
Syphilitic wife or child attending	.. 6 cases.
Cardiac failure and œdema	.. 3 "
Scar and discharge	.. 3 "
Warts	.. 1 case.
Nothing except a history of sore	.. 6 cases.
Infective granuloma	.. 1 case.
Stricture of urethra	.. 3 cases.
History of sore and leprosy	.. 1 case.

##### *Females.—*

Mother of syphilitic children	.. 3 cases.
Wife of syphilitic husband	.. 4 "
Discharge only	.. 9 "
Infective granuloma	.. 3 "
Asthma	.. 1 case.

In all but 5 cases, the Wassermann was either moderately or strongly positive.

Of the 5 cases which were serologically and clinically negative 3 were males and 2 females.

Among the males, one was partially treated outside, and in the other two cases their wives were attending for active syphilis.

Of the 2 females, their children exhibited unmistakable stigmata of congenital syphilis.

#### *Neuro-syphilis.*

There were 16 males and 2 females, forming only 2 per cent. of the total number of cases.

The lesions are classified as follows:—

##### *Males.—*

Meningo-myelitis	.. 1	
VIIIth and VIIIth nerve lesions	.. 1	
VIIth nerve alone	.. 5	of which 3 are neuro-recurrences.
Optic nerve	.. 1	
Hemiplegia (vascular)	.. 2	
General paresis	.. 2	
Spastic paraplegia	.. 1	
Tabes dorsalis	.. 2	
Facial spasm	.. 1	

##### *Females.—*

VIIIth nerve lesion	.. 1
I and VIIIth nerve	.. 1

The blood Wassermann test was positive in all but three cases. A striking feature of these cases is the large number of cranial nerve lesions (50 per cent.), particularly of the VIIth nerve. Of the six cases of facial paralysis alone, three appeared to be the so-called "neuro-recurrences" after insufficient treatment with arsenic.

A systematic cerebro-spinal fluid examination was not performed in these cases for various reasons. The few records of the results are not striking enough for publication.

#### *Congenital syphilis.*

There were 22 cases. The ages of the patients varied from 3 months to 20 years; 14 cases were under 10 years of age. There was a marked preponderance of female children, nearly twice the number of male children.

The symptoms for which they were brought for examination are classified as under:—

Cutaneous rash	.. 6 cases.
Condyloma of anus	.. 5 "
Depressed bridge of nose	.. 5 "
Other bony lesions	.. 6 "
Hutchinson's teeth	.. 1 case.
Discharge from nose	.. 3 cases.
Deafness and blindness	.. 1 case.

The mother's or the patient's blood was negative in 14 cases. The rash as seen, was usually confined to the genital, gluteal, anal



and buccal regions. Hutchinson's teeth were seen only in one case. Bony lesions, especially of the tibia, were seen in a third of the number.

#### *Treatment.*

The problem of persuading the patients to attend regularly and to undergo a prolonged course of treatment is a very real one. All possible facilities are afforded to the patients for regularly attending the department. The treatment is free, irrespective of the status of the patient, and as far as possible is confidential. The following table will give an idea of the nature of treatment the patients had:—

	One full course of treatment and more.	Partial and interrupted treatment.	No treatment.
Males ..	76 cases	418 cases	197 cases
Females ..	17 „	96 „	53 „

A third of the total number of cases had no treatment at all. They attended the clinic for a day and defaulted. Most of these untreated cases were in a highly infectious state and were potent sources for fresh infection. The partially treated constitute the majority of the patients. As soon as the visible lesions disappeared with one or two injections, the patients ceased to attend till they got a recurrence of the trouble. We have had a number of recurrences after insufficient and incomplete treatment. The recurrences are chancreal, cutaneous, bony and nervous. The bony recurrences are the most common and they are resistant to treatment.

#### *Complications.*

The immediate complications after either arsenical or bismuth injections were practically *nil*. There were only two cases, one of urticaria and another of collapse and temporary unconsciousness. The first was a patient who came in with left-sided facial paralysis and bilateral deafness. His Wassermann reaction was strongly positive. He used to develop a severe form of urticarial rash within a few minutes of an intravenous injection of arsenic. The rash quickly subsided with exhibition of adrenaline hydrochloride, 0.5 c.cm., hypodermically. When the intramuscular route was substituted, there was no reaction. The other was a boy of 14 who came in with a condyloma of the anus. The first intravenous injection of arsenic produced immediately collapse, flushing of the face and body and temporary unconsciousness. Recovery was complete in a few hours.

Of the later complications, there were 8 cases of albuminuria, 10 cases of stomatitis and blue line of the gums, 14 cases of cutaneous reactions, and one of jaundice.

#### *Albuminuria.*

All were males. The majority of the cases were middle-aged adults with late untreated syphilis. They were detected in the routine examination of the urines before each injection. They were mild cases and quickly subsided with temporary cessation of treatment. Bismuth is considerably more irritating to the kidneys than arsenic.

#### *Stomatitis and blue line of the gums.*

There were 7 males and 3 females. All the cases indicated intolerance to bismuth, except one in which recurrent stomatitis without any blue line occurred a few days after every injection of arsenic during the second course of treatment. With the stoppage of the arsenical injections, the condition never reappeared. In all the cases the teeth and gums were dirty and septic before treatment was started, and a preliminary dental prophylaxis was a desideratum. The condition subsided with the stoppage of treatment, cleansing and scaling of the teeth and exhibition of sulphur. The blue line takes some time to disappear.

#### *Cutaneous reactions.*

There were 12 males and 2 females. The cutaneous intolerance varied from mere itching to well-developed exfoliative dermatitis. It is our experience that the worst form of cutaneous intolerance is a "catastrophe that never comes unannounced." In all cases, itching of the skin was the earliest premonitory symptom of arsenical intolerance. In a few cases, gastrointestinal disturbance, stomatitis and oedema of the face were associated with itching.

Of the 14 cases 6 complained of itching only without any cutaneous lesion, 3 cases had a mild miliary papular eruption over the joint flexures and distal portions of the extremities. One case had oedema of the eyelids and congestion of the conjunctivæ. Another had well-marked arsenical hyperkeratosis of the palms and soles. Three cases developed exfoliative dermatitis. The onset of any of these cutaneous manifestations does not seem to bear any definite relationship to the quantity of arsenic injected, though they were rarely observed before the third injection. In only one case of severe dermatitis the condition proved fatal, the patient dying of broncho-pneumonia. All the cases responded to stoppage of arsenic and injections of sodium thiosulphate. After a variable interval of rest, the treatment was continued in all cases except in those of exfoliative dermatitis.

#### *Jaundice.*

There was only one case, of late syphilis, who developed a mild form of jaundice after 2 courses of the combined treatment. The case was lost sight of and could not be followed and investigated.

*Remarks.*

The writer wishes to indulge in a few random reflections before this article is concluded.

(1) There is no matter of doubt that the incidence of syphilis is on the increase in the city of Madras, though accurate figures are hard to get at.

(2) A little less than half the number of patients attending the venereal department are married, and they constitute fresh reservoirs for innocent and accidental infection of their wives and children.

(3) Nearly a third of the patients come from the mofussil. Most of them are poor, and have no place to stay at and undergo treatment for a sufficient length of time. This state of affairs can be remedied only when the district and taluq hospitals are equipped and staffed for special treatment.

(4) The morning attendance at the clinic is a hardship for patients of the working classes. The establishment of evening sessions would greatly contribute to their regular attendance.

(5) The fitting up of a laboratory for Wassermann diagnosis attached to and working in collaboration with the venereal department is a desideratum and will obviate the inevitable delay that obtains now.

(6) Intensive educational propaganda among the lay public is urgent and necessary. The public should be told that the treatment of early syphilis is certain, quick and a matter of months, while that of established syphilis is uncertain, slow and a matter of years.

(7) Misconceptions about the curability of syphilis by a few injections of arsenic are still rampant among the public.

(8) The writer pleads for a more enlightened medical opinion as regards the necessity for prolonged treatment and observation.

(9) The dangers of incomplete treatment with the newer arsenical remedies are being realised by syphilologists, and Ehrlich's ideal of a *therapia magna sterilisans* has hardly been achieved.

(10) The modern treatment of syphilis has become highly technical and requires specialists' knowledge and skill, and it is difficult to understand how the general practitioner, with miscellaneous work, is fitted or equipped to diagnose and treat syphilis in all its aspects.

(11) At present, efficient, prolonged observational treatment is possible only in institutions specially staffed and equipped for the purpose, unless a large number of practitioners are trained and are afforded the facilities of a free Wassermann service and the distribution of medicines free of cost.

(12) The curative treatment of syphilis is but a link in the long chain in the fight against syphilis. Experimental researches on syphilis are throwing considerable light on its ubiquitous

pathology, and the discovery of a potent vaccine may be the only hope for the prevention and cure of this disease.

My thanks are due to Dr. W. Happer, M.D., ch.B., M.R.C.P., Venereal Specialist, General Hospital, for permission to use the records of the Department and for various suggestions.

### A COMPARISON OF THE WASSERMANN AND KAHN TESTS IN 200 CASES.

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IN 200 cases, the amount of serum being sufficient, both the Wassermann and Kahn tests were done. In doing Kahn's test the following technique was observed:—

Kahn's antigen obtained from Parke Davis and Co. was used. It was diluted in the proportion of 1.0 c.c. antigen to 1.1 c.c. of sterilised normal saline, mixed 12 times and allowed to stand for 10 minutes. The patient's serum was heated to 56°C. for half an hour. The small rack and test tubes used in Dreyer's method of doing the Widal test were used. Occasionally other small test tubes were utilised and proved satisfactory. For shaking purposes in the first 40 tests, a vaccine shaker oscillating at the rate of 275 oscillations per minute was used. Later on hand shaking was resorted to and it served the purpose equally well.

In three test tubes 0.0125 c.c., 0.025 c.c. and 0.05 c.c. of the diluted antigen was placed and 0.15 c.c. of heated serum was added to each tube.

1	2	3
Normal saline 0.5 c.c.	Normal saline 0.5 c.c.	Normal saline 0.5 c.c.
Serum inactivated 0.15 c.c.	Serum inactivated 0.15 c.c.	Serum inactivated 0.15 c.c.
Antigen 0.0125 c.c.	Antigen 0.025 c.c.	Antigen 0.05 c.c.

The test tubes were shaken for five minutes with the hand or in the vaccine shaker, 0.5 c.c. saline was added to each tube, and in the first 40 tests the tubes were incubated for 15 minutes. In the remaining 160 tests, the test tubes with the necessary reagents were not incubated. The results were read at once, or after shaking again for 5 seconds. In the majority of cases, one could read the result even before saline was added, but flocculation when present was always well shown after the addition of saline.

A positive result was indicated by the appearance of coarse or fine flocculi uniformly suspended throughout the fluid and settling to the bottom of the test tube after 24 hours. In some cases, the fluid became clear, without any fine or coarse flocculi appearing; these cases were regarded as negative. In negative cases a thorough search was made to look for flocculi with the hand lens before declaring the result, and in doubtful cases the result was read even after 24 hours before giving a final reading.

If the capillary pipettes are marked with the amount of antigen and serum to be added, it facilitates the test and saves time. These marked pipettes should be tested off and on to see that the marking is correct.

Kahn's test was expressed in terms of +, ++, +++ according as flocculi appeared in one tube, two tubes or three tubes, and doubtful results were expressed as  $\pm$ . The Wassermann test was expressed as + if two doses of complement were fixed, as ++ if four doses of complement were fixed, as +++ if six doses of complement were fixed. Doubtful results were expressed as  $\pm$ .

A list of equivalents used is given as under:—

TABLE I.

*Comparative strength of the Kahn and Wassermann reactions.*

Reaction.	Comparative strengths.						
Wassermann	+++	+++	++	++	+	$\pm$	—
Kahn	+++	+++	++	++	+	$\pm$	—

Too much subdivision leads to confusion and unnecessary hair-splitting which serves no useful purpose. It is suggested that strongly positive sera in the case of Kahn's test should be expressed as +++ as stated above, and not as ++++ since only three test tubes are used in the test.

In these 200 tests, only in one test was the fluid turbid and also showed flocculi in all the three tubes, this case was considered positive. In the remaining 199 tests in positive cases, the fluid if it showed flocculation was also clear.

The following is the comparative statement of the results obtained in two tests.

There was close agreement in 90 per cent. of cases, disagreement in 10 per cent.

TABLE II.

*Giving brief history of the cases showing disagreement and the results of the two tests.*

Clinical condition.	Wassermann Reaction.	Kahn's Reaction.
Prolonged irregular fever ..	+++	----
Enlarged epitrochlear glands and fever.	+---	----
Frequent abortions ..	+---	----
Paraplegia ..	+---	----
Chronic bronchitis and enlargement of epitrochlear glands.	+---	----
Frequent abortions ..	++-	----
Interstitial keratitis ..	+---	----
Tingling sensation in the limbs and enlargement of epitrochlear glands.	+---	----

TABLE II—contd.

Clinical condition.	Wassermann Reaction.	Kahn's Reaction.
Pain in bones and joints ..	+---	----
Pain in joints and sciatica ..	+---	----
Paralysis of the ulnar nerve ..	----	+++
Intermittent fever ..	----	++-
Treatment case ..	----	++-
Tingling sensation in lower extremity.	----	+++
Passage of blood and pus in faeces.	----	++-
Irregular fever, history of exposure, patient cured later by antisyphilitic treatment.	+---	+++
Ulcers of rectum, history of exposure.	+---	----
Ulcers of mouth ..	----	++-
Irregular fever and cough ..	+ $\pm$ —	----
Past history of inguinal buboes, now suffering from blood and pus in stools.	+---	+++

#### Summary.

1. Kahn's test, on account of its ease, simplicity and suitability should be done in all cases, and in doubtful cases the result should be corroborated by doing the Wassermann test.

2. Kahn's test is very useful for mofussil practice where the Wassermann test is difficult or impossible to carry out.

3. Kahn's test should be the test of choice, even in big centres.

4. If Kahn's test and the Wassermann test are both done and agree in results, it leaves little doubt in diagnosis.

5. Kahn's test is fully reliable in tropical countries.

My thanks are due to Major Amir Chand, F.R.C.P., I.M.S., Principal, Medical School, Amritsar, who kindly supplied the material for the test out of the school funds.

#### A NEW AND SIMPLE TREATMENT FOR INTESTINAL TUBERCULOSIS, INTRODUCED BY M. McCONKEY.

By C. FRIMODT-MOLLER, M.B., Ch.B. (Copenhagen),  
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DURING the last four months we have tried in the Sanatorium at Arogyavaram, near Madanapalle, a new method in the treatment of patients suffering from the complication of intestinal tuberculosis. We have carried out this treatment in 25 cases. This number would, of course, be all too small by itself for the forming of a definite opinion based on our own work only, but McConkey, of the New York State Hospital for Incipient Pulmonary Tuberculosis, has made a very thorough investigation into the merits of this treatment and has published his findings only after three years of

careful research. The results we have so far experienced have so strikingly confirmed McConkey's results that I think it only right that doctors in India should have an opportunity of trying out a treatment so simple that every practitioner can use it and can bring, in many cases, much relief to patients suffering from all the distressing symptoms of intestinal tuberculosis.

The treatment as described\* by McConkey consists of placing in a small tumbler three ounces of strained tomato juice or the juice squeezed from an ordinary-sized orange. On the surface of the juice is floated half of an ounce of ordinary cod-liver oil. The whole is served immediately after meals three times daily.

When it was demonstrated that artificial heliotherapy is of value in the treatment of intestinal tuberculosis McConkey began to think that cod-liver oil might be of equal value, especially as ultraviolet radiation and cod-liver oil are equally effective in the treatment of rickets and practically interchangeable as anti-rachitic remedies. He began therefore to give cod-liver oil to patients suffering from intestinal tuberculosis, but was disappointed as he was not able to observe any improvement by its administration. While trying the effect of cod-liver oil, certain very sick patients were given orange juice with their oil in an effort to make the dose more palatable, and it was observed that these patients did better than those less seriously ill who were receiving cod-liver oil without the orange juice. Acting on this hint orange juice, and later the cheaper, but equally efficacious tomato juice, was added to the cod-liver oil in the routine treatment.

Very careful research work was then inaugurated and carried on for three years: 128 patients suffering from intestinal tuberculosis complicating disease of the lungs were observed: 28 patients, who had entered the hospital before the value of ultraviolet radiation was appreciated and who had received only ordinary palliative treatment, served as a control. Fifty patients were given ultraviolet radiation and 50 similar cases received cod-liver oil and tomato juice.

There was no outstanding difference in the severity of the intestinal symptoms or of the general condition of the patients in the three groups at the time they entered the hospital. The pulmonary lesion was either in the moderately advanced or in the advanced stage; cavities were present in 90 per cent. of the cases, and tubercle bacilli were found in the sputum of all but two. The diagnosis of intestinal tuberculosis was in all cases supported by positive radiographic findings.

It would carry us too far here to record all the different findings of this research. It is

sufficient to mention the condition of the 128 patients at the time of writing. Of the 28 control cases 71 per cent. were dead and 14.5 per cent. alive (14.5 per cent. could not be traced). Of the 50 patients who received artificial heliotherapy, 24 per cent. were dead and 42 per cent. alive (34 per cent. untraced). Of the 50 patients treated with cod-liver oil and tomato juice 10 per cent. were dead and 86 per cent. alive (4 per cent. untraced).

The improvement in the condition of the patients began within a few days or weeks. The patients gained steadily in weight and more rapidly than those treated with ultraviolet radiation; the intestinal symptoms usually disappeared promptly and completely, and the gastro-intestinal tract became normal on radiographic examination.

It should be pointed out that the patients often complain, as we have also observed in our cases, of slight gaseous eructations savouring of cod-liver oil for the first week or so.

McConkey has not observed any contra-indications as he has not so far seen any gastro-intestinal tract becoming worse after the treatment. He continues the treatment for several months to a year after the tract becomes radiographically normal, or for a similar period after all intestinal symptoms have disappeared.

In closing one deviation from the method described by McConkey must be mentioned. He lays great stress on serving the cod-liver oil and juice ice-cold, but owing to the difficulty of getting ice we have been unable to do this. When using absolutely fresh orange or tomato juice, before there is any possibility of fermentation, the serving of the oil and juice ice-cold would seem unnecessary. We have had the most encouraging results in spite of this deviation from the original method.

## THE ARTERIAL SUPPLY OF THE APPENDIX.

(From the Department of Anatomy, University Medical College, Mysore.)

By T. SESHACHALAM, L.R.C.P., M.R.C.S.,

*Professor of Anatomy,*

and

S. R. GORUR, M.B., B.S.,

*Lecturer in Anatomy.*

THE arterial supply of the appendix is derived from the ileo-cæcal branch of the ileocolic branch of the superior mesenteric artery. The appendicular artery passes behind the terminal part of the ileum, enters between the two layers of the mesentery of the appendix, and runs in its free border giving a variable number of branches to the appendix. This is the description in the commonly used textbooks in anatomy. Thompson and Miles' *Manual of Surgery* says "with its single artery of supply

\* *The American Review of Tuberculosis*, May 1930, Vol. XXI, No. 5.

.....which if occluded.....at once shuts off the whole of the appendicular blood supply." Beesely and Johnston in their *Manual of Surgical Anatomy* say "it does not anastomose with any other artery."

Having seen variations from this description in some cases both in the dissection rooms and in the operation theatre, we investigated the arterial supply of the appendix in the dissection room of the Mysore University Medical College.

The present series includes 21 cases. Of these eleven cases contained one artery supplying the appendix (Fig. 1), conforming with the textbooks in anatomy. In seven cases there

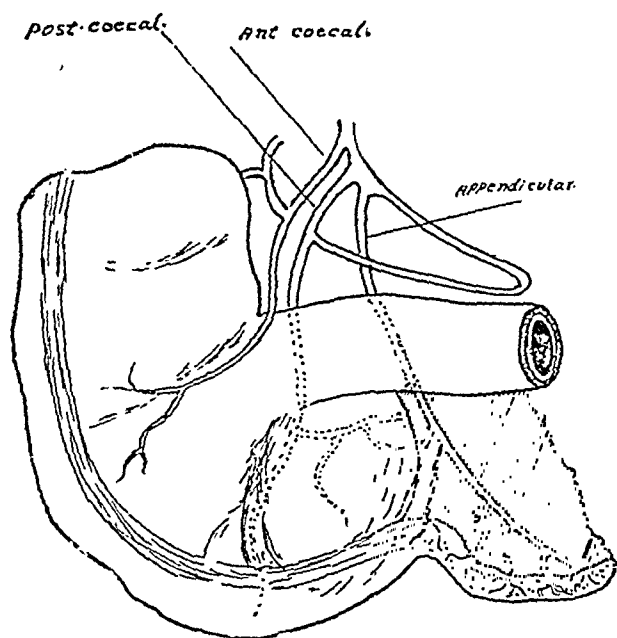


Fig. 1.

was a dual supply. An independent branch from the posterior caecal entered the appendicular mesentery and supplied the proximal part of the appendix. In two cases there was a double supply (as in Fig. 2) but the two arteries

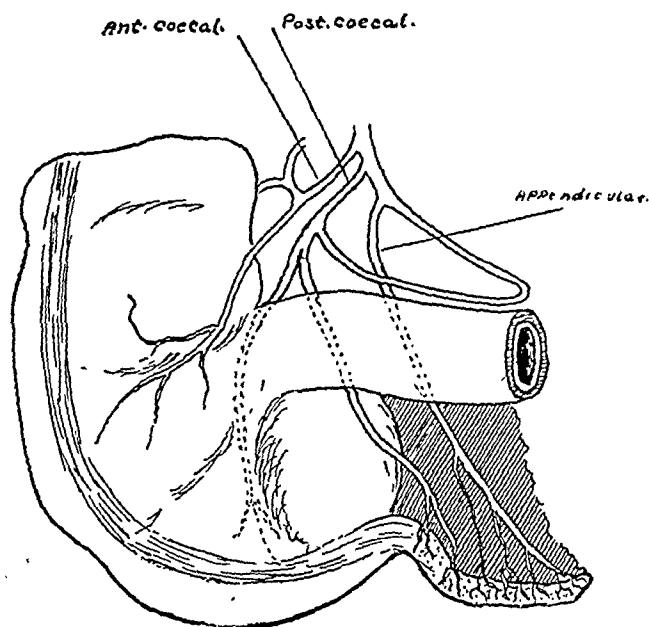


Fig. 2

anastomosed with each other forming a regular arch within the mesentery from which branches were given off to the appendix (Fig. 3). Invariably in these cases, where the appendix

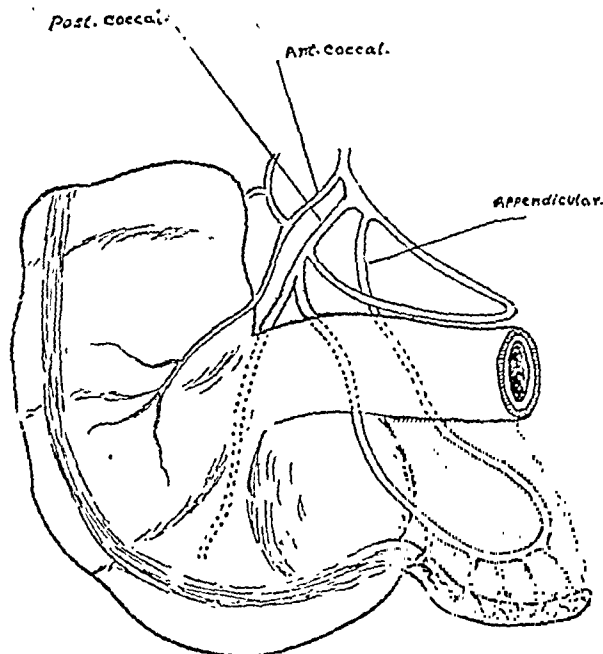


Fig. 3.

received a double supply, the appendix was longer than four inches in length indicating the necessity for a richer blood supply. In one case the appendix was bound down by adhesions and it could not be studied.

This investigation is interesting to the anatomist in establishing the variations in the blood supply of the appendix and also classifying them. It is of interest to the pathologist, for in cases of kinking or thrombosis the whole of the appendicular blood supply need not be shut off, at least in cases receiving a double blood supply. Many surgeons must have had the experience of applying an extra ligature near the stump of the appendix after the main artery has been ligatured in the mesentery. This little artery that troubles the surgeon is the independent branch from the posterior caecal.

This series of twenty cases is no doubt too small to draw any conclusions from but it serves to point out that the arterial supply is not so simple as is described in the ordinary textbooks in anatomy.

#### Summary.

(1) The artery supplying the appendix is not always a single artery.

(2) In some cases there are two arteries supplying it and in a small percentage of cases the two arteries form an arch.

(3) The classification is interesting to the anatomist, useful to the pathologist, and a safeguard to the surgeon.

## SOME DIFFICULTIES IN THE DIAGNOSIS OF INGUINAL HERNIA.

By A. K. DUTT GUPTA, M.B., D.T.M. (Bengal),  
Assistant Surgeon, Medical College Hospital, Calcutta.

INGUINAL hernias are quite common and the diagnosis is generally easy. There are some conditions, however, from which inguinal hernia has to be differentiated and these according to the standard textbooks—e.g., Beattie and Choyce—are encysted hydrocele of the spermatic cord, retained testis, a lipoma of the spermatic cord, enlarged glands in the groin adherent to the external oblique, a chronic abscess, and femoral hernia. But in this country a condition known as lymphatic varix or lymphangiectasis of the spermatic cord is met with which sometimes gives rise to difficulty either in the diagnosis of hernia or its contents.

Apart from the symptoms the chief clinical features of a hernia are a swelling in the usual place, which appears or increases on coughing with an impulse of expansible type; the internal ring may be bigger than normal. In most old-standing cases, the omentum owing to its weight, length and mobility, gets down to the bottom of the sac and may get adherent to its fundus. It is exactly this type of hernia which a lymphatic varix case simulates. In both these conditions there is an impulse on coughing, the ring is big, there is a peculiar doughy labulated feeling along the cord and the hernia is not completely reducible.

On analysis of all cases of hernia in the wards of Lieut.-Col. Sir Frank Connor, D.S.O., I.M.S., for the last two years the following figures were obtained:—

Per cent.

- |                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------|-----|
| (1) Cases diagnosed before operation as hernia, but no sac found, only lymph varix ..                            | 5   |
| (2) Cases diagnosed before operation as hernia, sacs found, also big lymph varix along cord ..                   | 6.3 |
| (3) Cases diagnosed before operation as bubonocoele. No sac found, only big retroperitoneal lipoma along cord .. | 2   |

Lymph varix, though it is a lymphangiectasis of the cord, unlike varicocele, does not change shape readily with posture, does not swell up much when the patient stands and does not go down readily when he lies down after it "comes out." It has not the feeling like a bag of worms, and no fluid thrill on coughing.

It must not be supposed that these cases were diagnosed casually and hurriedly. Most of them had been seen by eminent surgeons before admission and by many doctors and students after it. In one particular case of double-sided lymph varix where a mistaken diagnosis was made, one side was operated on and when the patient was well, the other side

was shown to a gathering of doctors at an exhibition. They could not diagnose it from hernia.

A few case notes may be interesting.

*Case 1.*—Mahommedan male, aged 25, diagnosed as double inguinal hernia, history for 2 years, the rings on both sides admit two finger tips, impulse on coughing, no gurgling on reduction.

*Right side* operated on in August 1929; no sac found but only a lymph varix which was ligatured at the internal ring and at the testis and removed. The weakness of the inguinal canal was repaired and the internal ring narrowed.

*Left side* shown as a demonstration to doctors. Operated on in October. Same findings and same operation done.

The blood contained microfilariae; the fluid in the varix also contained microfilariae. No history of filarial fever or manifestation. Patient seen one year after with a slight visible impulse at the right internal ring; otherwise well.

*Case 2.*—Hindu male, aged 40, came from Delhi as a case of omental hernia on the right side and bubonocoele on the left side, rings very big; impulse on coughing. At operation a lymph varix on the right side and a retroperitoneal lipoma on the left side were found.

*Case 3.*—European male, aged 11 years. A huge lymph varix was found at operation, but no hernial sac, varix dissected off. On examination of the blood and fluid microfilariae were found in both.

*Case 4.*—European male, aged 62 years, contents thought to be not completely reducible, gurgling present on reduction. On operation a very big lymph varix and a small hernial sac were found. The blood contained microfilariae but not the fluid from the varix.

I am grateful to Lieut.-Col. Sir Frank Connor, D.S.O., I.M.S., for kind permission to publish these notes.

## SLIDING HERNIA.

By T. SESHACHALAM, L.R.C.P., M.R.C.S.,  
Resident Medical Officer, Krishnarajendra Hospital,  
Mysore.

THE following communication is based on a careful examination of over a hundred cases of inguinal hernia both in the in-patient and the out-patient departments for a period of four years. It has been seen seven times in this series. The percentage is sufficiently high to consider this condition as a clinical entity and to demand publication of certain of its clinical features. Connell\* writing about hernia in Africans says he saw it eighteen times in 142 cases of right inguinal hernia. It has not till now received due attention in the commonly read textbooks on surgery.

The sac of an inguinal hernia increases in size in response to the gradually increasing contents that descend down. This increase in size takes place partly by stretching of the already formed sac and partly by pulling down upon the peritoneum lining the anterior abdominal wall. This peritoneum lining the posterior abdominal wall does not take part in this because of its firm attachment due to the

\* Connell, W. K. Hernia in South Africans. *British Journal of Surgery*, No. 69, July 1930, p. 16.



intervention of viscera and attachment of mesenteries. Under certain conditions the sac increases in size at the expense of the posterior wall peritoneum. In so doing the viscera are also pulled down. What was posterior wall becomes the fundus and later anterior wall. The posterior peritoneum and viscera slowly descend and form the neck, then the posterior wall, later on the fundus of the sac. This condition of a viscus gradually sliding down, to take part in the formation of the walls of a sac, is called a sliding hernia. The posterior wall of the sac is formed by a viscus (usually the cæcum) which is covered by peritoneum anteriorly, the posterior wall being devoid of peritoneum. The condition is quite different from the cæcum with a mesentery forming part of the contents of a hernia.

In all the seven cases the hernia has been on the right side, all of them in male adults who have had their hernias for a long period. The longest period in this series was fifteen years. In three cases a truss was worn and was discarded because of the pain and discomfort caused by its use. The hernia is easily reducible, but not completely. After apparent complete reduction there is still something which remains at the posterior wall and neck of the sac. The ring is usually large, admitting three or even four fingers which feel the impulse on coughing. With the fingers in the ring and the fingers of the other hand on the thickening on the posterior wall, the latter does not feel any impulse on coughing.

The contents of the sac seen during operation are usually coils of small intestine which are easily reduced, and the appendix which is not easy to reduce because of the cæcum being fixed in the sac wall.

The condition may be classified into three stages depending on the duration and the size of the hernia. The first stage where the cæcum is found forming the posterior wall of the neck of the sac, the second stage where the cæcum forms the posterior wall of the sac, and the third or extreme stage where the cæcum and variable portions of the ascending colon and the lower end of the ileum have their posterior mesenteric attachment across the inguinal canal in the scrotum. Of the series of seven cases two were of the first variety. Operation was easy, the appendix was removed, the cæcum was easily separated and pushed back, the sac ligatured in the usual way; and the operation completed. Four cases were of the second variety. Treatment was not easy. The appendix was removed, partial separation of the cæcum was carried out, a purse-string suture was placed in the sac distal to the cæcum and the operation completed in the usual way. Of the extreme stage only one case was seen. An old man aged sixty-five years presented a large right inguinal hernia of fifteen years' duration which had suddenly become very painful and tender. It has been irreducible for a long time.

With a provisional diagnosis of obstructive hernia, which did not react to the usual course of treatment by enemata, the case was opened up. A fair quantity of hydrocele fluid was emptied from the sac, coils of small intestine were reduced, and the posterior wall of the sac was found to be formed by the lower half of the ascending colon, the cæcum and the lower two or three inches of the mesentery of the small intestine. In fact, the posterior wall resembled the ileo-cæcal region in the right iliac fossa where a student dissects and studies the terminal branches of the superior mesenteric vessels, in the dissection room. Reduction was impossible and separation was found to be dangerous. The wound was closed and the patient was left alone.

The treatment of the large sliding hernias is a baffling problem. Connell suggests that a partial colectomy is likely to be of some use. This is certainly a good suggestion to be kept in the mind of surgeons. J. Fleissig\* suggests that it may be congenital in origin. He says "A certain laxity of the sub-peritoneal tissue in certain regions, particularly the iliac and hypogastric regions permits the development of ridges and folds which may be converted into bands, to which the peritoneal covering of the cæcum, appendix and ascending colon becomes attached. Such abnormal laxity might permit the formation of adhesions in the region of the internal inguinal ring into which the cæcum or appendix or both might pass and become attached to the posterior wall of a patent inguinal canal or congenital hernial sac."

Apparently sliding hernias are more common in South Africa and India than in England. Connell suggests that "It may be due in some measure to gaseous distension of the cæcum resulting from an almost purely vegetarian diet." Every surgeon in India has seen many cases of long standing inguinal hernia seeing the doctor for the first time for this complaint when strangulation supervenes. Large hernias of long standing drag down the sac already present and cause undue pressure on the posterior wall of the sac, which drags down the posterior peritoneum and the viscera in relation to it. I am of opinion that many of these cases depend upon such a mechanical cause. It would be difficult to explain the cause of the extreme variety by either of these theories. General visceroptosis plays a great part in the causation of this variety.

Among the complications that are seen in ordinary inguinal hernia incarceration should be the commonest, but I have not seen any report in the available literature. Strangulation occurring in a left sided sliding hernia has

\* Fleissig, J. Hernia of the large intestine. *British Medical Journal*, 1925. Epitome, p. 128.

been reported by Mr. Harry Gabb\* of Sussex in a man aged 80 years.

My thanks are due to Dr. S. Subba Rao, Senior Surgeon, Mysore, for permission to make use of some of his cases for this paper.

## A Mirror of Hospital Practice.

### RETENTION OF A DEAD ECTOPIC FŒTUS.

By KEDARNATH DAS, C.I.E., M.D. (Madras),  
*Professor of Obstetrics and Gynaecology, Carmichael  
Medical College, Calcutta.*

CASES are on record where a dead ectopic fœtus has been retained in the abdominal

Mrs. A., a Bengali, Hindu, aged 35, was admitted into the Carmichael Medical College Hospital on 31st May, 1930, with an abdominal tumour reaching above the umbilicus, of 2 years' duration, with occasional pain in abdomen for a year. She had had 3 children, her last child having been born 3½ years ago. Menstruation was regular up to the end of June 1928. There was acute abdominal pain with vomiting in the middle of August, followed immediately by the appearance of a mass in the lower abdomen. The mass gradually increased in size for the next 8 months to that of a full-term pregnant uterus. The patient felt foetal movements. In April 1929 there was again pain in the abdomen of a peculiar nature. After two or three days of this pain the foetal movements ceased. In May 1929 she

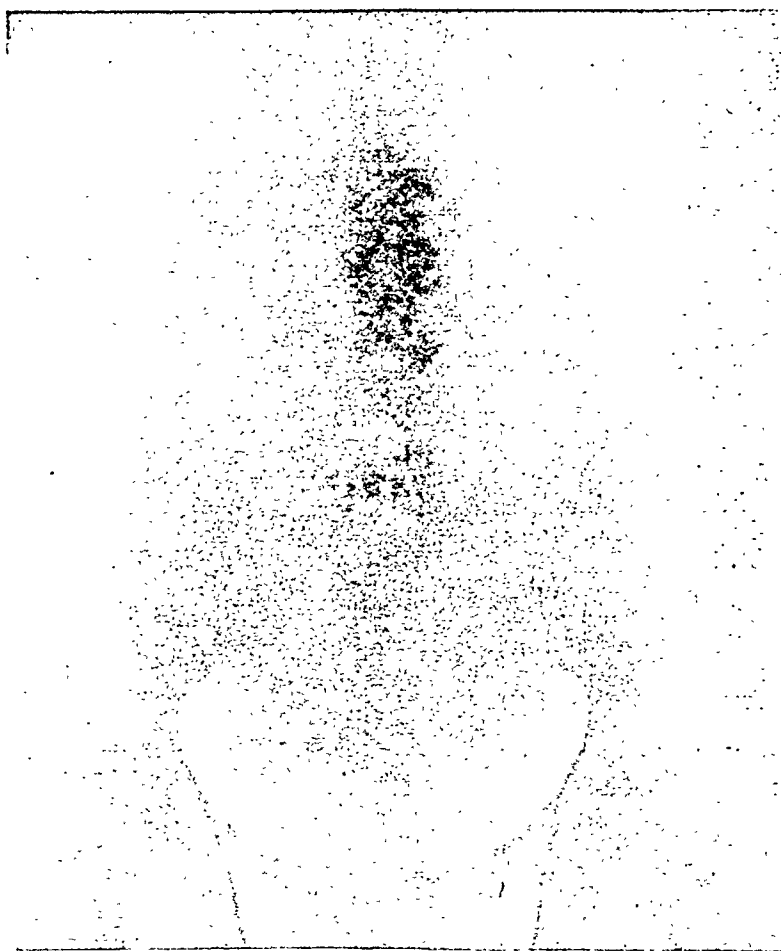


Fig. 1.—Skiagram before operation.

cavity for an indefinite period without untoward results; but once a definite diagnosis has been made, surgical intervention becomes obligatory.

The following case, which came under my observation recently, is worth recording:—

menstruated for the first time after a period of amenorrhœa of about 10 months. Menstruation has been quite regular since.

On admission to the hospital the mass reached two fingers' breadth above the umbilicus, movable from side to side, rather irregular in outline. Crackling was felt in one portion of the tumour. The uterus, normal in size, was felt separately pushed to left by the mass felt

\* Gabb, H. Strangulation of a sliding hernia. *Lancet*, 16th March, 1929, p. 554.

per abdomen. Hæmoglobin 45 per cent., red blood cells 2,850,000 and white blood cells 15,000 per c.mm.

Operation for the removal of the tumour was performed under chloroform on 16th June, 1930. An incision of about 7 inches was made. Omental adhesions were separated, the sac was opened and the fœtus removed.

remove the fœtus, leaving the placenta and sac *in situ* to be absorbed and to close the abdominal wall. The other method of treatment, viz., marsupialization has the advantage of a good immediate prognosis and is easy to perform, but the risk of secondary hæmorrhage and of septicæmia gives a mortality ranging from 13 to 40 per cent.



Fig. 2.—Photograph of fœtus with placenta in its compressed attitude.

The sac with the placenta was carefully separated as there were intestinal adhesions. The raw area was carefully peritonized. The weight of the fœtus was 4 lbs. 10 oz.

Subsequent progress was uneventful. Temperature never rose above normal except once to 99.6°F. on the afternoon of second day. The highest pulse rate was 108 per minute. She was discharged from hospital on 24th July, 1930.

It would be seen that the fœtus evidently died about a year before her admission to hospital and apparently there was complete regression of the placental vascularisation. The treatment adopted was *extirpation of the sac and placenta without drainage*. The result was quite satisfactory.

Bernard, however, in a recent communication in *Presse Medicale* on this subject, expressed the opinion that although the most rational method of treatment is extirpation of sac and placenta without drainage, he would avoid this method as in a case of his, where the actual operation was easily and rapidly performed, the patient died soon after operation. At the end of the operation the patient was pulseless; although respirations continued for a time, the picture being one of toxic shock. According to him the method of choice appears to be to

## DEATH FROM COMPRESSED-AIR SICKNESS IN INDIA.

By NRIPENDRA NATH GHOSE, M.B.,

Resident Medical Officer, Messrs. John Cochrane & Sons, Ltd., Hooghly Tunnel Contract.

THE following report on a death from caisson disease of a man working on the river Hooghly Tunnel being constructed by Messrs. John Cochrane & Sons, Ltd., of Westminster, London, is of special interest as it is probably the first report of a death from this disease in India.

C. S., a Punjabi Sikh, aged 20 years, was medically examined on the 25th August, 1930, in the morning and was found fit for work in "compressed air." He reported himself for duty on the same day and worked on the night shift. He was doing well during his two shifts of 3 hours each under a pressure of 36-37 lbs. per square inch (a little less than plus 2½ atmospheres). A little while after his second shift he went down again with some other men to attend to some urgent work. This time he was noticed to be dozing and felt lazy but did not complain of anything else. A few minutes later he came out with an old hand, taking about 30 minutes for decompression. About half an hour after decompression he complained of:—

- (1) General pain, mostly in the knee joints and abdomen.
- (2) Vomiting.
- (3) Inability to move his hands and legs.
- (4) Giddiness.

He was examined at once when his condition was as follows:—

- (1) Semiconscious.
- (2) Mottling of the chest, more marked over the left shoulder and left upper arm.
- (3) Eyes shut, pupils normal, cornea sensitive.
- (4) Hands and feet cold.
- (5) Emphysema in the subcutaneous tissues of the abdomen.
- (6) Pulse; radial pulse could not be felt, carotids pulsating, but feebly.
- (7) Heart: beating, but very feebly.
- (8) Respiration: hurried and shallow, about 40 per minute.
- (9) Knee jerks: lost.

*Treatment.*—Recompressed twice. There was much apparent improvement during the first recompression and for a few minutes after. Suddenly he became worse and died while being recompressed for the second time. Artificial respiration. Warmth, stimulation.

*Autopsy findings.*—(By Police Surgeon.) No cyanosis—no signs of external injuries—subcutaneous emphysema felt in the walls of chest and abdomen.

*Heart.*—Congested—fluid blood and post-mortem clot; bubbles of gas in the blood, more in right ventricle. The cavity of the right heart appeared to be dilated.

*Pericardium.*— $\frac{1}{2}$  oz. of blood-stained fluid.

*Pleura.*—4 oz. of blood-stained fluid.

*Lungs, liver, spleen and kidneys.*—Normal except for congestion. There was a distinct bleb on the upper surface of the right lobe of the liver.

*Bladder.*— $1\frac{1}{2}$  oz. of brownish yellow fluid.

*Stomach and intestines.*—Nothing special.

*Brain.*—Congested.

*Spinal cord.*—Macroscopically hæmorrhagic areas at different levels.

*Note by police surgeon.*—Cause of death: Caisson disease.

This appears to be the first case of its kind in India.

In conclusion I wish to express my sincere thanks which are due to Major B. G. Mallya, I.M.S., Police Surgeon, for having kindly allowed me to be present at the autopsy, to Dr. W. E. Fetherstonhaugh for his kind advice and encouragement I have received all along, and, last but not least to the representatives of the contractors but for whose untiring energy, and great interest, in the matter, it would have been almost impossible to get the autopsy done.

### SOME INTERESTING CASES.

By V. MAHADEVAN, F.R.C.S., M.R.C.P. (Edin.),  
MAJOR, I.M.S.,

and

T. K. RAMAN, M.D., D.T.M. (Cal.).

(From the Government Head-quarters Hospital,  
Guntur.)

STONE in the bladder is fairly common in this district; during the year 1929-30, we have operated on 19 cases of stone in the bladder. All of them were single stones.

#### *Distribution according to caste and nationality.*

	Males.	Females.	Total.
Hindus	13	4	17
Mahomedans	2	0	2

#### *Distribution according to age and sex.*

Age.	Males.	Females.	Number.
0-5	2	0	2
6-10	5	0	5
11-15	2	1	3
16-20	3	1	4
21-25	2	0	2
26-30	1	0	1
31-35	1	0	1
36-40	0	1	1
40-45	0	1	1
46-50	0	1	1
TOTAL	15	4	19

	Maximum age.	Minimum age.
Males	35	4
Females	45	14

Out of these 19 cases 14 are below the age of 20.

The photograph (Fig. 1) shows the size of the stones in relation to the age of the patient and suggests that the formation of the stone starts in childhood, the stones found in adults being developed from stones occurring in childhood.

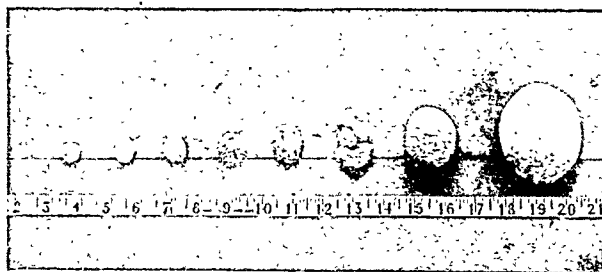


Fig. 1.—Stones in the bladder.

*Treatment.*—Supra-pubic cystotomy was the treatment adopted.

In three out of the four cases in females the stones were removed through the urethra.

#### *Observations.*

1. Stone in the bladder is common in this district.

2. It is mainly a disease of the poor and of males.

3. In the majority of the cases the formation of stone starts from childhood, and the stones found in adults are all developed from small stones occurring in children.

4. Cystitis has nothing to do with the origin of the stones, since we have never seen a case of stone in the bladder in children with cystitis.

5. Cystitis is due to secondary infection and occurs only after some time.

6. Hardness of drinking water in this place is a contributory factor in the formation of stone in the bladder.

#### *Gall stones.*

Gall stone, though not very common, is a condition encountered in this district. Three

cases were admitted into the hospital for symptoms of gall stones. Only one was operated upon and the other two refused operation.

The first case was that of a small Hindu boy aged 14 (vegetarian), admitted on 14th April, 1929, with a history of recurring attacks of pain in the right side of the upper abdomen for four years. During the attack, the gall-bladder was distended and was visible to the naked eye, painful and tender. There was no jaundice at any time and no history of typhoid fever could be elicited.

Cholecystectomy was done on 17th April, 1929, and a chronically inflamed gall-bladder with 42 stones of different sizes was removed (see Fig. 2). The patient was discharged, cured on 7th May, 1929. This case is interesting in that it occurred in a male child, and the symptoms started while he was 10 years old.



Fig. 2.—Chronic cholecystitis with gall stones.

The other two cases were, respectively, in an adult male of 38 years and in a woman of 40.

We had four cases of multiple gall stones out of the 50 medico-legal post-mortems conducted during the year 1929.

*Pelvic kidney with symptoms associated with menstruation.*

Mrs. P., aged 35, Hindu female, admitted on 13th April, 1929, for pain starting from the first menstruation, occurring with the succeeding periods with increasing severity. Vaginal examination revealed a lump in the right fornix. On opening the abdomen the uterus was found retroverted with two very small fibroids; the tubes and ovaries were normal. On the first and second vertebrae of the sacrum on the right side a small tumour could be felt. The peritoneum was incised and the tumour was identified as a small undeveloped right kidney, the blood supply being from the right internal iliac artery. The left kidney was normal. The right kidney was removed, and all the symptoms disappeared.

## A CASE OF HYDROPHOBIA.

By C. D. TORPY, I.M.D.,

*Military Assistant Surgeon, British Military Hospital, Trimulgherry.*

CORPORAL A., aged 21, was badly bitten over the upper and lower lips by a dog on the 30th June, 1930. There was no provocation to cause the dog to bite, and up to this, it had shown no signs of any unusual behaviour, nor was there any definite history of it having been bitten previously by any animal.

In less than half an hour the Corporal had reported sick at the hospital, where cauterisation of the wounds with pure carbolic acid was done, and antirabic treatment arranged for. The vaccine was wired for from Coonoor, and treatment begun on the 6th July, 1930. This was completed by the 19th July, 1930: the patient now feeling fit to resume his ordinary duties.

On the 24th July, the patient began to feel "out of sorts." The next day, he was no better, but as his bowels were costive, he attributed the ill-feeling to constipation. Finding, however, that his condition was getting worse, he reported sick on the morning of the 26th July, 1930. He now complained of intense headache, constipation, and general malaise. The patient looked obviously ill, and was accordingly detained in hospital for observation, though no suspicion of hydrophobia was entertained at the time.

Early on the morning of the 27th, the patient exhibited signs of terror with illusions of the senses. Insomnia was marked. The terror persisted; dysphagia and dyspnoea followed. An hour later spasmodic attacks supervened, which increased in intensity all the day. The spasms became more and more terrible, even in spite of liberal exhibition of hyoscine, and morphia. The patient succumbed at 13-40 hours on the 28th July, 1930.

The points of interest in this case are:—

1. The rarity of hydrophobia in the Army which is obviously due to the prompt antirabic treatment.

2. The onset of hydrophobia in spite of cauterisation within half an hour, and antirabic treatment.

3. The insidiousness of the onset in this case. The wound had healed, the scar was not painful or neuralgic, and there was no fever to usher in the main symptoms.

4. The dog was only four months old and as far as can be ascertained it had not been bitten. It had, however, made for another soldier four days after biting the deceased. He destroyed the animal by shooting it through the head and so there was no evidence available to prove the existence of "Negri bodies."

5. A mate of the deceased who had been bitten two days previously to the deceased by the same dog but who had concealed the fact up to now, and had received no treatment, is quite fit and apparently healthy.

6. In view of the above, the possibility exists that the deceased might have been bitten by some other dog previously, which caused the infection, and which he did not remember to have treated. The bite he received from this dog was perhaps only a mere coincidence.

My thanks are due to the Officer Commanding, British Military Hospital, Trimulgherry, for his kind permission to publish these notes.

# Indian Medical Gazette.

DECEMBER.

## MALARIA CONTROL.

A VERY pretty little controversy on the subject of malaria control has developed during the present year in the correspondence columns of our esteemed contemporary, the *British Medical Journal*. The issues involved are of such fundamental importance, and the correspondents concerned men of such outstanding reputation in the malaria world, that we cannot but deal with this subject in our editorial columns. The correspondence concerned should be read in the original by all public health workers and malariologists in this country.

The controversy opens with an editorial review in the *British Medical Journal* (February 1st, p. 207) of Col. S. P. James' report on malaria in Kenya and Uganda. In place of recommending to proceed at once with drainage, oiling, quininisation, or other accepted antimalarial measures, Col. James advocates the setting up of a special permanent organisation for the study of the local problems in detail. Different areas present different problems; what is applicable to towns may be impossible or unsuitable in rural areas. Diet, housing, economic status, general sanitation, and other factors are all concerned in the malaria problem. "In every malarious country separately an immense amount of patient labour in the field and in the laboratory has to be performed before it can be stated definitely on what lines antimalarial measures may proceed with hope of success." "Those who have been in constant touch with malarial matters will find little that is novel in much that Colonel James has to say on these points," comments the *British Medical Journal*. "How it is no longer thought necessary always and in all circumstances to base antimalarial measures on knowledge of the malaria-mosquito cycle; how malaria is a social disease; how diet, housing, economic status, general sanitation, and other factors play a part."

To this last paragraph Sir Malcolm Watson takes vigorous exception (*Brit. Med. Journ.*, February 8th, p. 259). His conclusions are directly opposite to those of Col. James; "my experience is that malaria is not a social disease; that diet, housing, economic status, and general sanitation are factors that play a practically negligible part in the spread of malaria in intensely malarial regions in the tropics. In Malaya nothing was more striking than how malaria struck the best-educated and the best-fed people, living under the best

sanitary conditions, if their houses were close to the breeding places of the species of anopheles which carried the disease." Control has spread from small towns to large towns, to estates, mines, private undertakings and public works, villages, and many rural areas, and a great organization was created in 1926 to cover the whole country. And he goes on to dwell on the magnificent results that have been achieved in the Federated Malay States—results with which our readers are familiar. Racial immunity can be acquired to malaria, but the process may take hundreds or thousands of years, and the population be decimated in the meantime; further, even when such immunity has been attained, it is exceedingly dangerous for any non-immune person to enter the area. The record of both Indians and Europeans in the Jeypore Agency tract in Madras is one of intense malaria, constant invaliding, black-water fever, and, too often, death. Antilarval measures, which reduce or exterminate malaria, automatically lead to an improvement in the economic status and social status of the community. Col. James may belong to the "modern school" of malariologists, but the "old school" of malariologists have the solid results achieved in Panama, Malaya, and elsewhere to their credit. Can the "modern school" produce any similar results?

"Colonel, late R. A. M. C.," comments on the results of screening barracks in Lahore and Amritsar cantonments. In 1925 both places had a very high malaria incidence. The barracks were now screened, and the malaria incidence in both places dropped by 50 per cent. in 1927 and 1928. He states that all new military buildings in malaria districts in India are to be screened (*Brit. Med. Journ.*, March 15th, p. 518).

The next contributor to the controversy is Lieut.-Col. C. A. Gill, I.M.S. (*Brit. Med. Journ.*, April 12th, p. 718). His chief comment is that the "old school" have come to a full stop; they consider that further research work on malaria is unnecessary and that it is only necessary to apply antilarval measures in order to abolish malaria. He holds that many of the *ex cathedra* statements of the "old school" receive no support from modern research, and hence the wide divergence of view that has arisen between the practical sanitarians and the scientific malariologists. "This difference of outlook would not be important were it not for the fact that the old school of malariologists have endeavoured to establish their view-point by means of unsubstantiated claims regarding their successes, and by their declamations, mainly in the lay press, against the stupidity and ignorance of those who presume to differ from them." Where huge tracts of territory, sparsely inhabited, have to be dealt with, antilarval control presents insuperable difficulties, both administrative and financial; and the



result is that administrators, who have been told that antilarval measures constitute the only available method of combating malaria, have been led to conclude, since they know that their measures, for financial and administrative reasons, are impracticable, that the control of malaria is impossible in such areas. They consequently regard malaria as an inevitable end and refuse funds for its control. "We thus arrive at the logically illogical position that one of the chief apostles of malaria control has unwittingly become one of the chief obstacles to progress in a matter of vital importance to the health and welfare of the Empire."

Sir Ronald Ross (*Brit. Med. Journ.*, April 26th, p. 797) makes the apposite remark that "there is only one school of competent malariologists—those who do the work.... Many people seem to think that malaria control is responsible for expenditure; they forget that the disease itself costs much more money.... If, of course, malaria could be controlled by cheaper methods, one would be only too glad, but I doubt whether it can be done."

Dr. J. T. Clarke, late Medical and Health Officer, Perak, is the next to defend the "old school" (*Brit. Med. Journ.*, May 3rd, p. 840). If, as Col. Gill thinks, the administrative and financial difficulties are insuperable, there does not seem to be much hope of preventing malaria. "The 'old school' however does not ask more than that the number of certain kinds of anophelines shall be kept under control in certain limited areas; and if this view is presented to the administrator he will, whether government or private, get over the financial difficulty and ask for further advice when he finds that he has achieved an economy." In a street in Singapore, inhabited by better class Chinese, there was intense malaria, although the social and economical status of the residents was good. Here malaria was abolished by the simple procedure of subsoiling a seepage in the locality which was the local breeding ground. With regard to Col. Gill's remarks about "unsubstantiated claims," has Col. Gill not heard of Panama or Port Swettenham? So thorough was the malaria control in connection with the Gunong Pulai dam near Singapore that a hospital provided in anticipation of a malaria outbreak for 30 beds never had more than 3 patients in it. Further, each local problem must be studied by itself; "if measures which would eradicate the anophelines which come from a lowland swamp are adopted for a ravine stream breeder, failure will result.... It has been demonstrated over and over again that expenditure on mosquito eradication, and even reduction, when properly carried out has resulted in better health, and therefore in the greater economic value of the population." It is Col. Gill who has adopted the "logically illogical" position, and his views, rather than

those of Sir Malcolm Watson, that are likely to do harm.

Dr. R. A. Murphy of South Sylhet, Assam, is the next contributor (*Brit. Med. Journ.*, May 10th, p. 886). Discouragement of the "old school" will serve no useful purpose, and stinting funds for malaria control will do a lot of damage. Antilarval measures cannot be applied in a haphazard way; each local problem must be studied by itself before measures are undertaken. Assam has thoroughly tried out prophylactic quinine, and has found it useless. The confusion with regard to different species of anopheles in the past has considerably hampered antilarval measures, and it is only recently that India has found herself in a position to commence operations on the correct lines. Until the "modern school" can offer something more promising than quinine and improvement in economic conditions, they are in no position to criticise the results achieved by the "old school."

Col. W. G. King, I.M.S. (retd.), is the next to enter the lists (*Brit. Med. Journ.*, May 17th, p. 928). "There seems to be no sound reason to believe that the giving of a new name to this group of malariologists (the 'modern school') will have more practical effect in preventing malaria diseases than has followed the obliteration of the name Mian Mir in favour of Lahore Cantonment." That further research in malaria causation would be advantageous may well be true, but to advance the mere theory or hope that, in an undetermined future, this may be so happily fruitful as to demand radical departures from present procedure cannot warrant the failure to use such measures as are available, and have hitherto proved successful in saving human life. It would be better to christen the "modern school" as the "wait-and-see school." The report on antimalaria measures in Kenya illustrates fully the temporizing policy of the "modern school." A passion for research in malaria may be praiseworthy, but it should not be allowed to prevent the application of existing knowledge in practical malaria control.

In the same issue Mr. R. Senior White replies vigorously to Col. Gill. The present-day malariologist of the "old school" does not attempt to abolish all mosquitoes in a malarious locality; his work is entirely based on species control. The exponents of the "old school" are certainly not "completely satisfied with the state of scientific knowledge attained some thirty years ago"; one has only to study the journals to see how much research work they are still carrying out, especially with regard to mosquito bionomics. Finally, he calls on Col. Gill to withdraw his statement about "unsubstantiated claims." The malariologist or medical entomologist, working for private commercial concerns, is often debarred from publishing his results, but such as he is allowed

to publish show what great improvements can be brought about by species control.

Dr. J. W. Scharff, of Singapore, comments on the fact that the present-day commercial success of the Federated Malay States would have been impossible but for the work of the "old school." Yet Col. Gill will have it that those who have achieved such successes must be banned as heretics whose existence "exercises a baneful influence on the prosecution of antimalaria measures." Those who know Sir Malcolm Watson know that he believes fully in further research work in malaria; indeed in his *Prevention of Malaria* he visualises a time when "drainage schemes may become methods of the past." In Malaya, happily, research and the practical application of existing knowledge go hand in hand.

By this time Col. Gill had been so vigorously attacked by the exponents of the "old school" that he took the opportunity to reply (*Brit. Med. Journ.*, June 21st, p. 1152). He points out that the "modern school" holds that "existing methods of mosquito control do not provide, for financial and administrative reasons, a practicable means of controlling malaria among the teeming millions of the tropics." Time alone will show which of the two schools of thought will survive; in the meantime the difference of opinion may be regarded as a healthy sign, provided the protagonists on each side keep an open mind. Antilarval methods may achieve success in a small area such as a rubber estate or a tea garden; they are not applicable to the vast rural areas of India where 90 per cent. of the population dwell. "In the present state of knowledge little or no progress in dealing with the problem of rural malaria in the tropics is possible, except on a small scale and in a few favoured localities, with the aid of antilarval measures *alone*, and it would appear to be unwise, in carrying out antimalaria measures in those areas, to ignore the part played by economic conditions and by human carriers." Unfortunately so many malariologists are entomologists, either by profession or by choice, that it is only natural that they should stress the purely entomological aspect of the problem.

Sir Malcolm Watson vigorously denies Col. Gill's suggestion that the exponents of the old school are "completely satisfied with the state of scientific knowledge attained some thirty years ago." On the contrary one of the greatest benefits conferred by Sir Ronald Ross' epoch-making discovery was that it opened out an ever-widening field for other collated lines of research work. The time has passed for talking about "unsubstantiated claims" and for saying that "it cannot be done"; the exponents of the "old school" indeed may claim that "we have been doing it all the time" (*Brit. Med. Journ.*, July 5th, p. 40).

Fleet Surgeon W. E. Home (*Brit. Med. Journ.*, July 26th, p. 163) asks whether the fact that there was no malaria in the hospital at Taranto during the war was due to the fact that the troops were well fed, or that the area had been drained, cleaned and oiled, and that the troops lived in screened houses. During the summer of 1918 malaria was kept under in the Palestine Expeditionary Force by antilarval measures, but the moment that the troops reached Damascus where the Turks had taken no antimalaria measures, a violent outbreak occurred as the result of military operations in unprotected country. Under malaria control in an endemic district one man can do the work which it took three men to do before control was instituted.

The next letter is a further one from Col. Gill (*Brit. Med. Journ.*, August 16th, p. 267). He complains that Sir Malcolm Watson has all along failed to appreciate the need of further research to enlarge the scope and increase the efficacy of antimalaria measures and, as illustrating his attitude, he mentions that when Sir Malcolm Watson visited India in 1924 he took little interest in a specially arranged exposition which Col. Gill had arranged of the technique employed in the study of the epidemiology of malaria. Anti-mosquito measures do not constitute the first and last word in malaria control, and if the immensely big and difficult problem presented by rural malaria in the tropics is to be solved, it can only be as the result of much further study.

The last letter to date in the controversy is a further reply by Sir Malcolm Watson (*Brit. Med. Journ.*, September 13th, p. 447). We confess that we regard it as a rather unfair personal attack upon an officer whose contributions to the literature of malaria and to public health work and policy in India have been both numerous and distinguished. Regarding Col. Gill as a patient, Sir Malcolm Watson's diagnosis is that the former is peeved because the latter took so little notice of the exposition arranged. His own view is that there is no single method of malaria control applicable to all conditions and all countries. He prescribes a tonic; far more field work is wanted, for laboratory results may be most misleading. Col. Gill should have a change of air and travel; he should visit and see for himself the malaria control in Malaya, Assam and Singhbhum. Similar anti-mosquito measures are now being introduced in Rhodesia, and the "old school" will be surprised if they do not yield results similar to those achieved in Malaya. "Less than ever, after my tour in Africa, am I inclined to sit down and allow the mosquito, uncontrolled, to work its will on man, and leave him to acquire after years of sickness that very imperfect thing—immunity to malaria."

Thus far the controversy, which we suppose will be continued further. Sufficient has been said however to show the marked differences of opinion which prevail among eminent malarialogists as to the best methods for the control and prevention of malaria.

\* \* \* \*

Now this question was very fully thrashed out at the Seventh Congress of the Far Eastern Association of Tropical Medicine held at Calcutta in December 1927. As a result the following resolution was passed by the full Congress:—

"As it has been represented that differences of opinion regarding the best method of controlling malaria sometimes cause doubt in the public mind and so may hamper the progress of anti-malarial work, this Congress takes the present opportunity to emphasise the fact that there is no single method of malaria control applicable to all countries.

"Nevertheless, they consider that for towns, mines, plantations, large public works and similar aggregations of people, the control of the breeding places of the malaria carrying species of mosquito is a method which should be employed, whatever other measures are put into force. Whenever possible this control should be effected by permanent works which eliminate entirely the sources of mosquito breeding.

"For wide rural areas, especially those with scanty, poverty stricken populations, the first step in the control of malaria is adequate research, so that the conditions present may be ascertained and the best methods of control under the particular circumstances ascertained as a result of such research. Methods of prevention may here be of great variety and include drainage, flooding, jungle clearing, jungle preservation, bonification, the promotion of agriculture, improvement of housing and the general economic condition, education, etc., of the people. The systematic killing of infected adult mosquitoes, screening, the use of antimalarial drugs, and a host of special methods have each also to be considered in their proper application.

"The Congress desires to stress the need not only of thoroughly trained malaria research officers, but of expert malarial engineers in whichever type of malaria prevention is at stake."

In our opinion, this resolution represents the true position. The "old school" are right, and so also are the "modern school." The problem of malaria control differs from one area to another; there is no royal road to it; no empirical measures will succeed; and nothing less than a study of each local problem in turn will indicate what is necessary.

Let us give three concrete examples of how the problem of malaria control varies, within the confines of India alone.

The first is that of Bombay. This, and Major Covell's report on it, was so fully dealt

with in our editorial for October last, that here it merely needs recapitulation. The northern half of the island is free from malaria, owing to monsoon flooding, and the disease is intense only in the densely populated southern half of the island. Climatic conditions are probably suitable for transmission almost all the year round, but the usual wave of incidence in the post-monsoon period is well marked. There is one vector, and one only, *A. stephensi*, breeding profusely in the wells, cisterns, garden fountains, cellars, and in temporary collections of water. The remedial measures suggested are the appointment of a whole-time malaria officer and staff, and stringent legislation which should be enforced. Every well in the city should be closed, every cistern covered with sheet iron or cement, and the tanks in the cotton mills regularly Paris greened. Bombay could be completely cleared of malaria at a fraction of what the disease now costs the city and its industries in sickness, invaliding, deaths, and infant mortality.

In this instance the policy to be followed is perfectly obvious. The chief difficulty lies in religious and caste prejudices against the closure of wells.\*

As a second example let us take the most valuable and instructive paper by Lieut.-Col. W. W. Clemesha, I.M.S. (retd.), and Dr. J. H. Moore, published on page 671 of our current issue, on antimalaria measures on the Travancore Tea Companies' estates. Here there is an entirely different problem. These two workers were fortunate in that their efforts were consistently backed up by the managing agents, and that the tea coolie population concerned was well disciplined and under full control. The two chief carrying species in the area are *A. maculatus* and *A. culicifacies*. During the winter there is no transmission, but with the onset of the spring warm weather the malaria season commences in March, and reaches its most deadly maximum in May. With the onset of the rains—which are very heavy in Travancore, some 90 inches or more annually—the larvæ are washed out and malaria ceases. There may be a slight recrudescence after the rains, but it is unimportant.

It will be seen that this malaria problem differs completely from the conditions present in northern India. The authors have solved it by a most admirable time-table. (Their paper indeed contains many useful "tips" for all concerned in malaria control; especially the administration of euquinine with sweetened condensed milk to children who are gametocyte carriers;

\* The Public Health Commissioner with the Government of India informs us that the Municipality of Bombay applied for Major Covell's services for his survey of the city, and paid for them. They also published his report. During the last financial year they have spent approximately Rs. 1,47,000 on malaria control in Bombay. It would appear therefore that vigorous anti-malaria measures are now being taken in Bombay.

this actually makes prophylactic quinine popular instead of unpopular.) The time-table is roughly as follows:—

(i) During December and January bungalows, staff quarters, and servants' houses are spring cleaned, whitewashed, and—if necessary—fumigated. This destroys hibernating anophelines in these quarters.

(ii) In February all adults are examined. Anæmic individuals are picked out, and special attention is paid to those who were on the previous year's malaria roster. Blood films are taken as necessary, and all persons showing parasites are fully treated.

(iii) On February 15th all children on the estates are put on to a daily dose of "euquinine and milk." (On most of the estates this measure has now been abandoned, since it is no longer necessary, owing to the success of the measures employed.)

(iv) On the 1st March antilarval measures are instituted, and, as every estate has been mapped for breeding places, these measures have admirable results.

(v) In the case of anyone reporting sick with fever, blood films are taken and, if the case is one of malaria, the patient undergoes the standard treatment. This consists of a course of alkalies and quinine, or of cinchona febrifuge, following up by an "antigametocyte" treatment with plasmoquine.

(vi) Control ceases when the rains are well established.

Their results are given in their first table. Spleen rates, which were from 10 to 82 per cent. in 1925, have come down to from 2 to 6 per cent. in 1930, and malaria is now almost a minor disease in the protected estates. (We are especially glad to publish this report, because the fate of most of such reports is to be pigeon-holed in some commercial or government-office, and the lessons learned and experience gained are lost to view.) In this particular instance, malaria control is assisted by the economic conditions, which are very favourable, since the coolies are well paid, well fed, well housed, and contented.

Here is a problem where combined antilarval and antigametocyte measures have achieved most notable results.

Lastly, let us take Col. Gill's own problem of epidemic malaria in the Punjab. There is no necessity to go to statistics to visualise it; it can actually be seen with the naked eye. If one stands on the hill-side at Kasauli at the end of the rains, one can see the problem of epidemic malaria in the Punjab for oneself. Five thousand feet below, at one's feet, lies the vast land of the five great rivers with their countless tributaries. As far as the eye can see there is standing or running water and the green of vegetation and of cultivation. Dotted here and there throughout the immense tract are the small villages so characteristic of the

Indian country-side. And the whole land is just commencing to dry up, like some vast sponge.

The problem of epidemic malaria in the Punjab is briefly reviewed in Col. Gill's wonderful book, *The Genesis of Epidemics*—a book which we would advise every medical research worker, every public health official, and every malariologist in India not merely to read, but to study closely, for it is admirable in its wealth of careful and suggestive thinking, and in its reasoned and restrained conclusions; it constitutes a contribution of notable importance to the study of epidemiology.

The Punjab comprises an area of 99,846 square miles, with a population of 20,685,024: it contains 158 towns in which 10 per cent. of the total population live, and 34,099 villages in which 90 per cent. of the population live. Almost three-quarters of the area is subject to annual epidemics of malaria in the autumn, and those who lived through the terrible malaria epidemic of 1908 in the Punjab will never forget it. There are 17 species of anopheles within this area, 14 of which are potential carriers of malaria, though *A. culicifacies* is the one species of supreme importance. Lastly, there is next to no money to spend on malaria control and prevention.

Will Sir Malcolm Watson, with his life long experience in the control of malaria, kindly outline what policy he would adopt under these circumstances?

Let us see what policy Col. Gill has adopted. It is outlined in his *Genesis of Epidemics*.\*

In the first place, so far from confining himself to laboratory studies, Col. Gill has envisaged the problem from the broadest possible epidemiological point of view. He points out that conditions in the true tropics—e.g., Malaya, Bengal, and the Assam Valley—differ completely from those in the sub-tropics, such as the Punjab. There are three main factors concerned in the spread of malaria: (i) the transmission factor; (ii) the infection quantum; and (iii) the immunity quantum in the population concerned. Now any one of these three factors may vary. In the true tropics, where there may be hyperendemic malaria, transmission is possible almost all the year round. The infection quantum is high, but—as a result—the immunity quantum is also high. Here the population tend to gain immunity in adult life, but only at the cost of a very high infant and child mortality. Sir Malcolm Watson is perfectly right to dwell upon the amount of suffering which an indigenous population undergoes under such conditions in attaining this immunity.

The result of these more or less balanced conditions, however, is that—though these areas

\* Gill, C. A. (1928). *The Genesis of Epidemics*. London: Baillière, Tindall and Cox. Price, 21s. net.

may show hyperendemic malaria—malaria epidemics do not occur in them (except when new non-immune labour is introduced, when there may be a virulent local outbreak).

In the Punjab and the sub-tropics conditions are entirely different. There is a prolonged and sometimes severe cold weather, during which the anophelines are hibernating and transmission ceases. This reduces the infection quantum to a minimum, but—as a result—the immunity quantum is also reduced to a minimum. Under these conditions, given a few years of famine or high food prices, which will destroy the cattle and reduce the resistance of the population to infection, an abnormally heavy monsoon, which gives rise to an abnormally high prevalence of transmitting anophelines, is responsible for the occurrence in the autumn of a great and widespread epidemic of malaria associated with high mortality. In short, widespread epidemic malaria in the autumn is the price which the Punjab pays for its very pleasant cold weather. And it is of but little use to institute antimalarial measures *after* the epidemic has set in; the horse has already bolted from the stable.

In Col. Gill's opinion anti-mosquito measures are impracticable, as neither the men, money nor material necessary to institute mosquito control over this wide area exist, and he has therefore concentrated attention upon palliative measures in the shape of quinine and drainage, etc., and in the meantime he has endeavoured to investigate the mechanism of these epidemics with a view to discovering fresh ways and means of controlling them. The result of his investigations has been to enable him to prepare accurate malaria forecasts each year—a preliminary forecast on September 1st, and a final one on September 15th. These depend on four main factors: (i) the humidity or rainfall factor; (ii) the spleen rate factor at the beginning of the epidemic season; (iii) the economic factor, which is represented by the average price of food grains during the preceding two years; and (iv) the "epidemic potential factor," which is the coefficient of correlation between the total rainfall in July and August for each district concerned, and the recorded "fever" mortality in October and November for the period 1868 to 1921. Of these (i) is known; (ii) is ascertained beforehand by a spleen index survey; (iii) is known, and also (iv). Hence it is possible early in September to issue a malaria forecast; to assemble men and munitions for antimalaria operations in the dangerous districts beforehand; and such forecasts, now published for the last eight years, have proved to be very accurate in the light of what actually happened. "Forewarned is forearmed," and to know beforehand where and when epidemic malaria is to strike the province is to know beforehand where and when to

institute the antimalaria measures necessary. They may be antilarval—as in towns, or the issue of prophylactic quinine, or both combined.

The upshot of this policy has been the institution of a great organisation for distributing quinine in rural areas, and land drainage operations and anti-waterlogging measures on a large scale, with the result that endemic malaria has been reduced and epidemic malaria apparently abolished from areas that previously were highly malarious and peculiarly liable to frequent epidemics. It is a not inconsiderable achievement.

We have tried to show how varied is the problem of malaria control and prevention in different areas in India. There is one last point which must be referred to. As the result of innumerable papers which have appeared during the past fifteen years, it is now possible to define fairly accurately the position with regard to "prophylactic quinine." It will not prevent the development of malaria in a person bitten by an infected anopheline mosquito, but it will render such malaria fever, when it occurs, comparatively innocuous—and this especially with regard to epidemic malignant tertian infections. Hence its routine use cannot be recommended, but for those who are exposed to conditions where other measures of control are impracticable—e.g., troops on active service, men on shooting trips in infected areas, engineers and labour forces on construction work in hyperendemic zones—prophylactic quinine is indicated. It may not ward off a subsequent attack of malaria, but it will enable men to remain on duty under conditions of exposure to infection.

We suppose that the controversy between the "old school" and the "modern school" will continue, but we agree with Col. Gill that there is no harm in such divergence of opinions so long as both parties preserve an open mind and avoid personalities.

R. K.

## Special Articles.

### "IS PUBLIC HEALTH WORTH WHILE?"

AN ADDRESS DELIVERED ON THE 29TH APRIL, 1930,  
TO THE ROTARY CLUB, RANGOON.

By G. JOLLY, C.I.E.,  
LIEUTENANT-COLONEL, I.M.S.,

*Officiating Director of Public Health, Burma.*

WHEN I was invited to address the Club, I at first felt at a loss for a suitable subject, but after some reflection decided that I might interest you best by propounding a question and attempting to answer it. This is the question I have selected—"Is Public Health worth while?" It is a subject which was well discussed a few years ago in the medical press, but which is perhaps a new topic of thought to some of my audience.

At first sight the question seems rather childish. Of course Public Health is worth while: everyone knows that. We maintain a large Public Health staff in

England, and have been pioneers in this branch of work. We have prided ourselves on our Public Health development as a nation, and even in Burma we have a major Department of Government specially for this purpose. On the other hand, there is no reason why we should accept general beliefs without examination, and it is open to question just how much Public Health is worth while. As a matter of fact, there are many men who, while admitting that Public Health is generally speaking a good thing, fail to support specific health projects or laws, when these become so personal as to affect either their pockets or their liberty of action.

### *The Laws of Health.*

Public Health and Hygiene have been variously defined as the science of healthy living, the measures that may be taken for the promotion of health or the prevention of disease, preventive medicine and so on. I prefer to regard Hygiene as "that branch of science which deals with the laws of health," and Public Health as "the practical application of these laws of health to communities." That a study of the laws of health is worth while no intelligent educated person will dispute. It is when we come to their practical application in our civic life that differences of opinion appear. Obviously the question has a humanitarian and an economic side and at times these two aspects clash. From the humanitarian standpoint, anything which tends to promote health or to prevent disease deserves support. The economist, however, may look askance at measures which tend to preserve the unfit at the expense of the fit, or which seem to impose an immediate burden upon trade and commerce for a distant and, as he may put it, a doubtful advantage.

In discussing the question "Is Public Health worth while?" I shall endeavour to pay due attention to the economic side of the question.

Public Health measures affect either the environment or the individual. They may be carried into effect either by projects or by rules of conduct. Sanitary projects for the most part are directed towards the improvement of the environment, while legislative rules in the main direct the action of the individual. This rough classification is admittedly defective, but it is a convenient one for my present purpose and I shall adopt it.

### *Environment is Changeable.*

First of all a few words about the individual and his environment. We are all of us the product of our heredity and our environment. Our heredity for good or bad is a fixed quantity; our environment is changeable. Public Health measures cannot, with the exception of that branch which Galton called "eugenics," affect our heredity. They can only act upon us through the medium of our surroundings. Thus, if we wish to be long lived, our best plan is to select long-lived parents. This is well known to life insurance companies, but they likewise know that, within limits, our environment also affects our longevity, and they have a way of adding extra premia to our policies, to counter-balance such risks of life as residence in definitely unhealthy places or the following of dangerous, or unhealthy occupations.

Many of the early steps taken in England at the beginning of the sanitary reformation were of the nature of "sanitary projects," with the definite object of improving the environment, so as to reduce the incidence of disease. These include such measures as the provision of pure water, the construction of good drainage, the rapid removal and efficient disposal of rubbish and excreta, and the provision of healthy houses. These may be regarded as the fundamentals, or as Sir Andrew Balfour has called them the "gilt-edged investments" of the Public Health market. Their intrinsic value is so great, and their dividends in improved health so certain, that all enlightened Public Health authorities invest largely in them. I do not doubt for a moment that my audience here agrees with me that these

measures are worth while, both from the humanitarian and the economic standpoint. Nevertheless in this country we still lack many of these fundamentals, and there are not a few unready to admit that these things are necessities, or that they pay.

Take the case of water supplies. Between twenty and thirty years ago, all English textbooks on public health dealt in great detail with water supplies, especially in their simple forms, such as rain water, shallow and deep wells, springs, streams and lakes, and their suitability as sources. Nowadays the majority of textbooks deal very perfunctorily, if at all, with such matters. The reason is that in England we have got past this stage. The health officer has little to do with advising on sources of water supply. The supplies have for the most part been provided long ago, and have been in successful operation for many decades; their management has become a routine matter, and only occasionally a question of extension comes up, which is dealt with by a few specialists on the subject. The man in the street thinks not at all of his water supply. He has only to open a tap and obtain an abundance of pure water. He has no occasion to wonder if it is safe; he knows it is. The position in this country is in marked contrast. It is the exception in England to find a town or large village without a pure safe water supply; it is the exception here to find one with it.

### *Protected Water Supply.*

The value of a protected water supply to health is enormous, and is indeed almost incalculable. There is a great group of diseases which are usually or frequently spread through the medium of water. The group includes cholera, typhoid fever and dysentery, three diseases which are so rare as to be curiosities in England, while they are ever with us in this country. These diseases are nowadays looked upon as tropical diseases. It is worth while remembering that at one time they were all of common occurrence in England. In the 19th century the British Isles were ravaged by epidemic cholera, which caused so many deaths that, following the severe epidemic of 1871, public opinion became thoroughly aroused, and the Government of the day was forced to take immediate energetic action to improve the Public Health. It is no exaggeration to say that epidemic cholera in England was one of the principal causes that led to the establishment of the Local Government Board, and to the modern development of Local Government. In the eradication of cholera from England, the provision by local sanitary authorities of pure water supplies was a decisive factor. The great English Public Health Act of 1875, which has served as a model to the world, laid upon all local bodies the duty of providing their districts with a wholesome water supply, whenever an existing supply was a danger to health, either on account of insufficiency or unwholesomeness.

What has been done in England can be done here. The provision of pure water supplies in towns and districts is an essential step in the eradication of cholera and other water-spread diseases. That it will in time prove successful is evidenced by the chart, which was published in the *Annual Public Health Report of Burma for 1924*. The marked contrast between cholera rates in the years preceding the introduction of a piped water supply, and in those following it, is well shown. A pure water supply pays. Not only is cholera reduced, but all water-spread diseases with it, and many other diseases too, which are fostered by insufficient or impure water. But while a pure water supply pays, it requires energy and authority on the part of a Local Body to introduce it, and economy in its use. I know of no town in Burma in which the introduction of a pure water supply was not opposed at the outset by the uneducated and shortsighted among the people, and I know of no town which after its introduction did not appreciate the advantages, or which subsequently desired to revert to its former conditions.



*Cost of Piped Water.*

The cost of a piped water supply is fairly well understood by the man in the street in England, but not so in Burma. The tendency here is to regard water as the gift of God, and to use it with prodigality. Unless this tendency is curbed, and curbed with firmness, the introduction of a piped water supply does not pay, at all events from the strictly economic point of view. Where uncontrolled waste is allowed the position becomes impossible. I was in Hongkong some 18 months ago. It is a town with very similar climate and population to Rangoon. I enquired about the water supply and was somewhat surprised to learn that it varied from 18 to 25 gallons a head per day. I was informed that, when they had only 18 gallons they were a bit short, but that with 25 gallons a head they did very well. On enquiring how they managed, I was told that prevention of waste and metering were the secret. I was shown a copy of the *South China Mail* of that date in which the following appeared—

"Sergeant Henderson charged a coolie before Mr. R. E. Lindsell this morning, for wasting water at a fountain in Mallory-street. According to the Sergeant, while on beat at 11-30 this morning, he saw the defendant fill a kerosene tin with water at the fountain. Then without turning off the water, defendant crossed the street with the water tin and returned with an empty one. For about 45 seconds the water ran to waste before defendant returned. A fine of \$3 or in default six days' hard labour was imposed."

Judging from Hongkong's experience it would appear that similar measures in Rangoon might postpone the present acute water shortage, and give perhaps ten years' grace for the careful preparation of schemes for future extension to the supply. Before leaving the subject of water supply, I would like to refer to the *Report of the Punjab Government's Expert Committee on the metering of Piped Water Supplies*. Referring to the repeated occurrence of water famines in municipal towns provided with piped water supplies the Committee states: "No single remedy for this state of affairs can be found, but the installation of meters, both on the mains under municipal control and upon house connections, will exercise a profound effect in limiting the waste of water."

Time alone prevents me from considering in detail other groups of sanitary projects, such as drainage and sewage schemes and housing. These are considered in England as on a par with or only slightly inferior in importance to water supplies. An ill-drained site is an unhealthy site. It is not commonly realised how drainage schemes in England have eradicated malaria, a disease which used to be prevalent in many parts. I have seen country farmers in the South of England suffering from typical ague fits, the result of malaria, reintroduced during the war, in an imperfectly drained Anopheles-infested area, by convalescent soldiers from the East. They wondered what had hit them, and could not understand what had gone wrong with the old country.

Sewage schemes, and particularly the introduction of the water carriage system, have revolutionised city life. Picture the state of English towns conserved by the pail system—flies everywhere, typhoid and dysentery rife, and epidemic summer diarrhoea taking its terrible toll of infants and young children. The water carriage system of sewage disposal is costly and therefore only economically practicable in closely settled communities, but it certainly pays high dividends on the capital invested. It is now becoming well recognised that no large institution or housing scheme should be permitted in an urban area, in or out of the tropics, without a water carriage system of sewerage removal.

Good rubbish disposal is also a gilt-edged investment. Rubbish heaps are usually the most prolific sources of fly breeding around a town, and many flies always mean a high mortality and much sickness, with the inevitable economic loss. I look upon the improvement of rubbish disposal in Rangoon as only second in importance

to the improvement of the water supply. The 1926 epidemic of flies and dysentery must be fresh in many of our minds. Disposal by dumping into the sea or by incineration in destructors are the two obvious alternatives. Either of these methods would make a wonderful difference to dysentery incidence in Rangoon.

Healthy housing has been described as the basis of Public Health. It is significant that the great housing schemes of England, which have brought about the construction of over a million new houses since the war, have been supervised by the Ministry of Health. Even so, many unhealthy houses have been built. Dampness was the principal fault and as this predisposes to rheumatic fever, it is a serious fault. Arising out of a *Report by the British Medical Association Subcommittee on Rheumatic Heart Disease*, the Science Committee of the Royal Institute of British Architects recently carried out a survey of such damp houses, and found that, of those built during the last ten years, in 32.8 per cent. the dampness was due to porosity or faulty construction of walls, in 26.6 per cent. to inadequacy of damp proof courses, and in 14.4 per cent. to failure to cover the site with a surface of suitable concrete.

*Anti-mosquito Measures.*

I cannot leave the subject of sanitary projects without a reference to anti-mosquito measures. The wonderful anti-mosquito work, carried out by Surgeon-General Gorgas, enabled the United States of America to construct the Panama Canal after the French attempt under De Lesseps failed on account of disease. That this fine piece of work paid there can be no doubt. A perhaps greater though less spectacular work has been carried out successfully in Malaya, where a great part of the country has been freed from malaria by anti-mosquito measures. One has only to note the enthusiastic way in which the hard-headed planters there, and in Ceylon and Assam, have tackled anti-mosquito work, to be convinced that their enthusiasm has not been inspired purely by philanthropic motives. I have recently returned from a visit to that great mining concern in the Northern Shan States, The Burma Corporation, and have been amazed at the energetic way they are tackling the malaria problem there, but the Burma Corporation is fully convinced that health pays, and has put its beliefs into practice in a most efficient manner.

Not only do mosquitoes spread malaria, they are also responsible for yellow fever and dengue. Yellow fever is a dangerous disease with a high mortality. If it ever reached Rangoon, teeming with the carrier mosquito, the black and white *Stegomyia*, the result would be a disaster of the first magnitude. The disease is endemic on the west coast of tropical Africa, and with rapidly improving means of communication, the danger of its spread to other parts of the tropics is increasing. The Eastern Bureau of the Health Section of the League of Nations at its meeting a few weeks ago is reported to have passed a resolution, recommending Eastern countries to prohibit aeroplane communication with yellow fever infected areas. Because of this danger and of the serious prevalence of dengue and the mosquito nuisance generally, the Corporation of Rangoon has accepted my suggestion to carry out a mosquito survey of the town and this is now in progress.

As an illustration of how authorities with an intimate knowledge of yellow fever appreciate the value of anti-mosquito measures, I would mention that, when yellow fever was re-introduced into Rio de Janeiro in 1928, causing 351 deaths in 9 months, 6,000 men a day were employed on anti-mosquito operations. They evidently believe there that anti-mosquito measures are worth while.

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Legislative measures to benefit the Public Health generally affect the individual. They may prohibit certain actions dangerous to the community, such as the import of dogs from abroad into Great Britain without

adequate quarantine against hydrophobia, or they may make compulsory the performance of certain beneficial actions, such as compulsory notification of infectious disease, or compulsory vaccination.

Rabies was at one time as common in Britain as it is now in many parts of the tropics. The muzzling order, combined with licensing and quarantine of imported dogs, has freed the country from this terrible disease.

Vaccination, owing to Jenner's great discovery, has relegated epidemic smallpox to the more backward (in the sanitary sense) countries. Smallpox, which was once a national scourge in England is now, as the Chief Medical Officer of the English Ministry of Health has put it, "the perquisite of those who elect to have it." Even in Burma we have tackled smallpox more thoroughly than any other disease. In spite of many difficulties, administrative and otherwise, and in spite of the rudimentary nature of our Public Health Department, which has in the past been able to do little more than act as spectators and chroniclers of outbreaks of preventable disease, we have succeeded in reducing smallpox mortality in Burma by about one half during the last 15 or 20 years. That we have not stamped it out is due solely to the incompleteness of our vaccination; but of recent years there has been an improvement in this respect, and if we steadily push our policy of universal vaccination and re-vaccination we shall certainly succeed in eradicating this loathsome and easily preventable disease from the country. Our knowledge of the method of prevention in this case exceeds the practical use we have made of it.

#### *Inoculation.*

I have mentioned cholera in relation to water supplies, but there is an individual method of preventing cholera as of preventing smallpox, namely by inoculation. We have only been using this in Burma for the last four or five years, and yet we have had remarkable results. In an epidemic, which broke out in the Meiktila District in 1928, the disease attacked 152 villages with a population of 55,011. Out of this population we inoculated 32,450 persons. Among these we had only 38 deaths from cholera, while among the 22,561 uninoculated persons we had 706 deaths. A rough rule-of-three calculation from the deaths among the two classes shows that our inoculation campaign saved approximately 1,000 lives in these infected villages alone, not to speak of the spread of disease to other villages. The cost of our inoculation campaign works out to between Rs. 7 and Rs. 8 per life saved. If we value the lives of villagers of the Meiktila District as low as the price of a Negro slave in the 18th century, namely £18, our little inoculation campaign has saved the District of Meiktila and the Province nearly 2½ lakhs.

Someone has remarked that "nothing is so misleading as facts except figures," a remark with a good deal of truth in it, but both the facts and figures in this Meiktila case are very striking, and I would claim that 1,000 lives saved in one cholera outbreak at a cost of under Rs. 8 per life is "worth while" both from the humanitarian and the economic standpoint, and is an encouragement to proceed with similar measures in other outbreaks.

Rules regulating the conduct of individuals for the good of the public health must be enforced if they are to be effective. Such rules are either in the form of acts passed by the Legislature, or of bye-laws made by the local bodies, urban or rural. It must always remain the duty of the Government of the country to ensure that such local bodies frame the necessary bye-laws and take steps to see that they are effectively enforced. This enforcement of bye-laws for public health can only be properly carried out by Health-Officers appointed for the purpose, and one of the first steps taken in England by the Local Government Board after its creation, was to insist upon all local authorities appointing such Health Officers. The function of a Medical Officer of Health was, in the words of Sir John Simon, first Chief Medical Officer of the

Local Government Board, to act as "an impartial accuser and adviser against whatsoever unwholesome influences in his district may be removable under the sanitary law." Obviously such important duties can only be efficiently performed by a public servant of high moral and technical qualifications, not subject to the changing influences of local politics. The building up of such a service of Medical Officers of Health is an essential step in the development of Public Health and of good Local Government.

It is a truism that history repeats itself. Eighty years ago in England "the current conception of a local authority was that of a body with power to do as it pleased, even were it pleased to do foolish things, or to do nothing." That false conception of "local government" which implies that the part is greater than the whole, or at least its equal, was corrected in England by the creation of the Local Government Board. We are at a stage of development in Burma when history is repeating itself, and when it is necessary for local bodies to remember that they hold their authority from the Government of the country, and that this Government cannot divest itself of its responsibility of controlling the actions of its subordinate authorities to whom powers have been delegated. For the system of Local Government to be successful, local bodies must recognise the central authority as one whose function is to act as a sort of Father O' Flynn.

"Checking the crazy ones

Coaxing onaisy ones

Lifting the lazy ones on wid the stick."

I have perhaps diverged somewhat from my immediate topic, but it has seemed to me necessary to emphasize that if the Public Health functions of local government in this country—and these are the main objects of local government—are to be exercised successfully, and to be "worth while" we must be guided by the experience of countries which have been successful in their operation. Those of my friends in the Public Health Departments of the United States of America, whom I have consulted on the matter, have generally admitted that the intrusion of local politics into the matter of the appointment and control of Health Officers in the "States" has proved a serious handicap, and has militated against the rapid development of Public Health under the Local Government system. Public Health to be "worth while" must be efficient, and there is no room for patronage or for the undue influence of vested interests. The law must be uniformly observed and equal for all.

#### *Preventable Disease.*

I have touched upon sanitary projects and rules of conduct; a few words are necessary about the economic loss caused by preventable disease. My war-time colleague, the late Dr. Maynard, who was an eminent statistician, as far back as 1908 calculated the loss due to certain preventable diseases in the Union of South Africa at £2,640,000 per annum, but quoted Lord Playfair's words. "The record of deaths only registers as it were the wrecks that strew the shore, but it gives no account of the vessels which were tossed on billows of sickness, maimed as they often are by the effects of recurrent storms." This maiming effect is very marked in certain of the preventable diseases such as tuberculosis, malaria and dysentery.

Col. Christophers has pointed out that, while in England out of every 1,000 persons born 530 reach the age of 50, in India only 186 reach that age. There is further nothing to show that the natural span of life in India is any shorter than in England. The difference, which must represent many crores of rupees a year lost to India in productive work, is accounted health in India. Col. Christophers goes on "All I can say is that the tribute paid to disease in a country like India is one of importance economically, even politically, and one that has many financial and commercial aspects. It however transcends this in being of

importance to the welfare of 320 million human beings who, by their tacit acceptance of such calls as may be made upon them, signify their belief that they are being governed to the best ability of those responsible for such Government. The important matter therefore seems to be that proper and enlightened views should be held by Government as to the steps to be taken to justify that trust." Health is purchasable. We have a pretty good idea of its cost, and can estimate it as so much per head of population, but to obtain it we must be prepared to find the money. Is it worth while? An Insurance Company as a business measure has spent 18,700,000 dollars spread over 15 years upon a vast health programme among its policy holders, and has estimated the reduced mortality saved thereby at 35,000,000 dollars in the same period. We consider it worth while to cure disease, and spend large sums of money for that purpose. Surely it is more worth while to prevent disease.

Even in that branch of Public Health which is considered by some most open to challenge—I refer to Child Welfare—the words of the English economist Malthus remain as true to-day as on the day they were written: "It should be remembered that a young person saved from death is more likely to contribute to the creation of fresh resources than another birth. It is a great loss of labour and food to begin over again. And universally it is true that under similar circumstances that article will come cheapest to market which is accompanied by fewest failures." Under the strenuous conditions of modern life, the prize in the contest goes to the race that is fittest. It is an open competition and in the result the health of the competing nations must be the decisive factor.

I have attempted in all too short a time to answer the question "Is Public Health worth while?" To a Rotary Club whose members are business and professional men, having as their ideal "Service before Self" the question should be one of interest and importance. For myself I find that the Rotarian ideal is identical with the ideal of the Health Officer. The longer I study Public Health the more firmly I become convinced that if "based upon knowledge tempered with caution," Public Health measures are worth while, and that indeed few things are more worth while. The preservation of law and order is a "sine qua non" of stable Government: given that, the first consideration, for both humanitarian and economic reasons, should be the Health of the People.

#### HEALTH EDUCATION—A DEVICE.

By A. HAMID, B.Sc., M.B., B.S., D.P.H.,

Assistant Hygiene Publicity Officer, United Provinces.

THE problem of awakening what may be termed a health conscience in the public presents peculiar difficulties in the East, as the aspects of this important

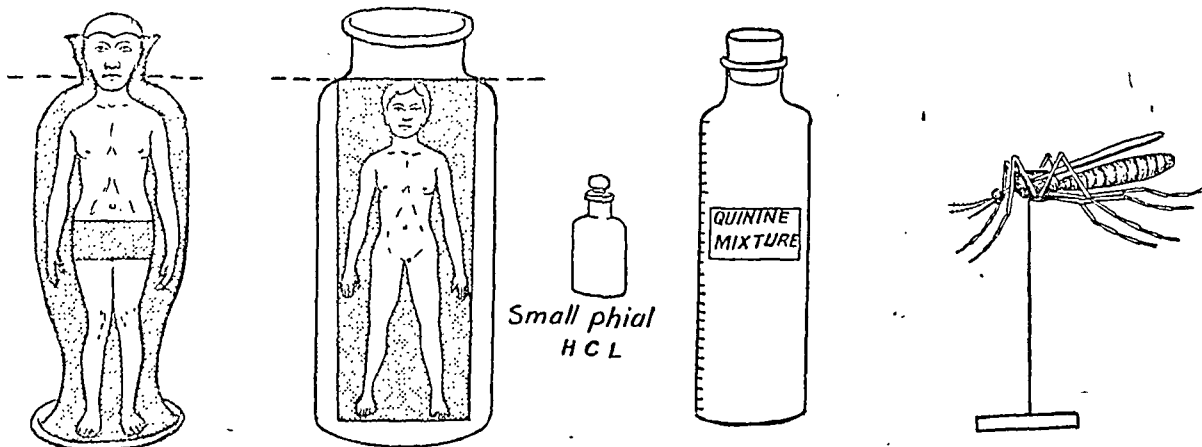
in newspapers, as illiteracy forms a formidable stumbling block. The important question is not education in the hygiene of the pre-cancerous or the pre-nephritic stages, but in the avoidance of the scourges of such epidemics as cholera, plague, smallpox and malaria. Something is being done; and with the introduction of medical inspection in schools the teaching of hygiene in schools has received attention and the propaganda work carried out among the public in various forms is a healthy sign. Public health exhibitions and health weeks which include popular lantern lectures and health films are useful aspects of the work. This note is therefore written to describe a simple experiment which forms an attractive device of educational value for the illiterate villager. It was first mentioned in an original article entitled "Notes from the Diary of a Medical Inspector of Schools" in the *Indian Medical Gazette* of May 1922. Since then it has been improved upon and used extensively at exhibitions in the United Provinces. It admits of still further improvement and modification but they will necessitate extra expenditure. The device described below costs little and can be set up anywhere.

The ignorant public is not prepared to believe that a small insect like the mosquito can be so poisonous as to vitiate the quality of a comparatively enormous amount of blood, produce malaria, and consequent prolonged anæmia.

Take a short-necked wide mouthed white flower vase and paint the front in black, leaving the outline of the body of man in the middle; a cardboard head is then tied to the neck with a strip to complete the man, and this hides the neck of the vase. Or the whole form of a man is cut out on paper which is pasted on a white short-necked bottle; in this case the neck of the bottle remains uncovered. Partially fill the bottle with water which is tinged red with weak caustic soda solution and phenolphthalein. This will show that man has plenty of red blood in his body.

Have a mosquito cut out in cardboard and mount it on a stand at the height of the man's face. Bring the mosquito in contact with the man and explain that in biting the small insect pours a few drops of her poison in the body, and simultaneously pour a few drops of strong hydrochloric acid from a small phial into the man. The public will see that the few drops of poison have rendered the man pale and anæmic and will be reminded of the pallor and weakness of the sufferers from malaria in their own homes.

Next, pour into the model, drop by drop the liquid from a longish phial which has a large number of small marks for doses and is labelled "Quinine Mixture." It can then be shown and explained to the full conviction of the people that for the cure of the results of a few drops of the mosquito poison (don't use the word parasite) a large quantity of quinine will have to be given, as the laked "blood" in the anæmic man will only gradually regain its normal tinge. This demonstrates



subject are quite different from those in the West. It is not so important to issue leaflets and insert notices

the importance of prolonged treatment after malaria and incidentally makes one realise that not only

are insufficient quantities of the bitter drug available for the cure of all cases of this widespread curse in villages, but also that salvation lies in its prevention rather than cure.

The phial marked with doses contains a weak solution of caustic soda and not quinine.

Rough sketches of the various articles mentioned above are attached to make the working of this simple device clear.

## Medical News.

### BRITISH SOCIAL HYGIENE COUNCIL.

MANY important aspects of public health and social hygiene in various parts of the British Empire were dealt with by speakers at the dinner in London on July 15th, at which the delegates to the Colonial Conference were entertained by the British Social Hygiene Council.

Sir Basil Blackett, K.C.B., K.C.S.I., the President, was in the chair.

#### *Venereal Disease in the Colonial Empire.*

The alarming spread of venereal disease among natives in the Colonies and the urgent need for more effective treatment was stressed by Mr. L. S. Amery in opening the British Social Hygiene Council's One-day Imperial Conference in Westminster. "We have drawn the attention of the Colonial Office to the whole question," he stated. "A great deal has been done in recent years, still it is a fact that we are not attempting to touch in Africa, more than about 6,000,000 out of the 35,000,000 people in the areas committed to our charge, and when one considers what might be the ultimate consequences in this 30,000,000 of the spread of disease, it seems well worth while to make a special effort to cope with this problem as soon as possible."

One of the difficulties, he said, was to provide anything like an adequate European staff. This gave rise to the question of training native dispensers and assistants of all kinds. Education by films was of immense value provided that the film was really made suitable for local conditions.

Professor Julian Huxley said that in dealing with illiterate native populations, the cinema and the wireless were going to be of the greatest value in any programme of education.

Biology had a great practical rôle to play in the work of education. It was important culturally and socially to include a certain amount of nature study and broadly conceived biology in the curriculum of every child in the Empire.

Mr. E. E. Biss of Kenya said that European teachers to teach biology to natives were a rather expensive necessity.

A delegate complained that nature study, as taught in our own secondary and elementary schools, stopped short of the reproductive functions.

#### *Recreation and the Mercantile Marine.*

The great difficulty that seamen have in obtaining recreation and reasonable pleasure when they come ashore, was dealt with by Mr. L. S. Amery in a speech to the British Social Hygiene Council.

"The port district in any great seaside place is often the least cared for," he declared, "and the least attractive. In the absence of proper provision for recreation and reasonable pleasure, less desirable forms of recreation are offered, and are practically the only kind to which the seamen finds access."

Mr. Amery stressed the great need for port welfare centres where local authorities working in close association with the voluntary organisations, could provide reasonable recreation to interest seamen when they come on shore. The signatory States to the Belgian Convention had secured that effective free treatment for seamen suffering from disease was to be given at

the ports. Britain, most of the Dominions, and some of the Colonies had accepted the provisions of this convention.

Mrs. C. Neville Rolfe, O.B.E., said it was hoped that by 1932, the British Government would be in a position to report to the International Labour Office in Geneva, that a scheme of port welfare, to provide healthy social intercourse for seamen, was being put into operation.

#### *The Empire and Social Hygiene.*

The question of how to co-ordinate Maternity and Child Welfare Services with the efforts now being made to combat the spread of venereal disease, was discussed by the British Social Hygiene Council at a One-Day Imperial Conference held at Westminster.

"This question was of great importance," said Mr. L. S. Amery who was in the chair. In the ante-natal treatment of expectant mothers lay a very big field for improving the health of the future generation. Experience showed that the percentage of healthy children born might be enormously increased by ante-natal treatment. The real remedy for venereal disease lay not in licensed houses and periodical examination of women but in the effective provision of treatment.

"We want to secure the willing support of the women," he declared, "in the colony in which we may be working. It can best be secured through the agency of European women. We have appealed to the Colonial Office to indicate officially its goodwill towards women's work on these lines, by encouraging the wives of colonial civil servants and officials. The women could get into really human touch with the native population, if they were taught the native languages."

Dr. Flora Lloyd, assistant medical officer of health for Swansea, said the women's venereal disease centre in Swansea was put into the same premises as the ante-natal and post-natal clinics in order to avoid suspicion in the minds of women that they were being treated for venereal infection. There were different rooms and different entrances. If patients asked a direct question about the treatment, they were informed of their condition. Only part-time nurses were employed, and they were engaged also in school and health visiting work. The chief source from which patients reached the centre was from the ante-natal clinic.

The child population was under close medical scrutiny, and all suspicious cases were referred to the clinic for investigation. A feature of the work of the Swansea clinic was the effective following up of cases. The total number of attendances for 1929 was 10,548. A marked improvement had taken place in the general health and in the local conditions.

Swansea did not believe it had solved the problem of the ascertainment and treatment of venereal disease in mothers and children. Their net was of very coarse mesh and probably caught only a small proportion of cases. Co-ordination with the maternity and child welfare and school medical services was fairly complete.

They were, however, completely out of touch with the venereal disease department of the Swansea Hospital, and with general practitioners and the midwives. The confidential nature of the treatment was a great stumbling block. If the clinics were an integral part of the Public Health Clinic Services, she believed that venereal disease ascertainment work would be much more complete.

Dr. Socrates Noronha, of Bombay, said they had reached a definite solution of the difficulty. There was an infant welfare scheme in Bombay with ten centres each with special officials, including one or two venereal disease specialists who worked at two special sessions per week. All the suspected cases of venereal disease are referred to these special sessions.

Mr. Amery: Are the doctors in charge ladies or men?

Dr. Noronha: Ladies.

Mr. E. Turner, F.R.C.S., said that those who had anything to do with appointment to these centres should bear in mind that practitioners chosen should have, not a slight, but a very definite knowledge of venereal disease. A great many newly qualified men

were appointed to the centres whose knowledge in that respect was infinitesimal.

When he was a member of the General Medical Council some years ago, he tried to get venereal disease put into the curriculum of the men who were being trained. He went through the whole of the examination papers of every qualifying body, and, in that huge number of questions, only three dealt with the question of venereal disease.

#### CALCUTTA BRANCH, BRITISH MEDICAL ASSOCIATION.

A CLINICAL meeting of the Calcutta Branch of the British Medical Association was held at 6-30 p.m. on Friday, the 12th September, 1930, in the library of the Calcutta School of Tropical Medicine.

Dr. Kedar Nath Das, C.I.E., in the chair. Ten members were present.

Lieut.-Col. V. B. Green-Armytage, I.M.S., showed the following cases:—

*Case 1. Acromegaly plus pregnancy.*—The patient was a Hindu female, aged 39, in her first pregnancy, and almost at full term. The acromegalic condition had developed during the pregnancy. There was very marked prognathism, well brought out in a very clear skiagram, with very large hands and feet. The sella turcica was very well marked, but there was no blindness, and no indication of pituitary tumour. Recent work had shown that the pituitary puts out two hormones; one of which stimulates menstruation, whilst the function of the other is to keep the ovum intact in the uterus after conception; injection of the urine from a pregnant woman into an immature female rabbit will cause it to commence menstruating.

Col. Green-Armytage had not been able to find any previous record of pregnancy in an acromegalic; he considered the condition in this patient to be an exaggerated physiological one, rather than pathological. Labour was expected in about a week's time, and it would be interesting to see whether the acromegalic condition subsequently clear up.

*Case 2. A case of pseudo-hermaphroditism.*—The patient was a young Bengali married to a college student and dressed in female clothing. The face had female characteristics, but the voice was that of a male, and the chest and pelvis had male characters. There was a pseudo-penis, the size of that of a boy of 8 or 10. The vagina ended in a cul-de-sac, and no gonads could be detected. True hermaphroditism is almost unknown, only 7 cases being recorded in the literature. In partial hermaphroditism with external male characteristics, ovaries are usually present, and *vice versa*. Psychically, the patient had feminine characteristics and it was interesting to note that this was the case in spite of the absence of gonads.

*Cases 3, 4, 5. Inversion of the uterus.*—Complete inversion of the uterus is stated to occur about once only in 400,000 labours; yet three such cases had been seen at the Eden Hospital within the last four months. The first was one of acute inversion, and the patient collapsed and died two hours after re-inversion of the uterus under anaesthesia. The second patient was admitted in a moribund condition. The third patient had chronic inversion of 7 years' standing, and a diagnosis of fibroid polypus was made in the outpatient department.

*Case 6.*—The uterus and ovaries of a case of pregnancy in one horn of a bicornuate uterus, removed at laparotomy. The head of the child was found protruding into the peritoneal cavity, and the fetus was mummified; the duration of the condition since conception was one year.

In discussing the cases, Dr. Kedar Nath Das said that he had never previously seen the combination of acromegaly with pregnancy. Pseudo-hermaphroditism might have important medico-legal bearings. He could recall two cases. One was admitted to hospital for painful erection of the "penis"; the external characters were feminine, but there was a tender testis in one

labium. The second instance was the child of extremely wealthy Indian parents. Here two eminent medical men were called in and certified the child to be a female, although the condition really present was one of pseudo-hermaphroditism. Had they certified the child to be a male, he would have come in for a large fortune.

With regard to inversion of the uterus, sudden acute cases were not so difficult to deal with, nor were chronic cases; it was the intermediate group that required very careful handling, e.g., cases seen at the 5th or 6th day after labour. He had known two deaths to occur in such cases from shock after re-inversion of the uterus; a waiting policy was best.

Dr. S. K. Mukherjee, F.R.C.S.E., D.O., D.O.M.S., next showed the following eye cases:—

*Case 1.*—A male, European patient, with transient unilateral oedema of the eyelids. The condition lasted for 2 or 3 days, then cleared up, then recurred; duration one year. The antrum, sinuses, and teeth were all sound; and at first no cause for the condition could be found. It was associated with enlargement of the preauricular gland on the same side. Examination of the blood at night, however, showed a filarial infection to be present, and the transient oedema was apparently due to this.

*Cases 2, 3, 4.*—Three patients, all males, with a history of the sudden onset of dimness of vision in one eye. The first was a heavy smoker. Thorough examination revealed no apparent cause for the condition, but he gave a history of dysentery some time previously, and cultures of the stools showed an abnormally heavy growth of enterococci. He was treated with autogenous vaccine, his smokes reduced, and his vision was now 6/6. Neither of the other two patients were smokers, but both gave heavy cultures of enterococci, and cleared up on treatment with an autogenous vaccine. He wondered to what extent intestinal toxæmia was responsible for this condition.

*Case 5.*—A case of ectropion in a young Hindu female child, treated by blepharoplasty, the pedicle being taken from the nose.

*Case 6.*—A case of false myopia. Such cases were not uncommon. He had had such patients coming to him after they had been wearing —3 or —4 D glasses for 6 to 8 months, even in one instance —9 D for 3 years, with no improvement in their vision. These cases were often wrongly diagnosed and wrongly treated. The condition present was one of spasmodic hypermetropia, causing the rays coming through the lens to be brought to a focus in front of the retina; if they were examined with the ocular muscles paralysed the true state of affairs was discovered. The treatment was to discard all glasses, stop all study for a short period, and instil atropine. The condition was especially common in young subjects with strong ocular muscles.

In the discussion on Dr. Mukherjee's cases, Dr. B. P. Trebedi said that, on plating stools, there appeared to be no correlation between the number of enterococci present and the clinical symptoms. Vaccines of staphylococci and *B. coli* often proved of value in cases of intestinal toxæmia. Col. Green-Armytage remarked on the association of heavy enterococcus infection with the pernicious anaemia of pregnancy; vaccine treatment was often successful in such cases. Lieut.-Col. R. Knowles, I.M.S., said that the characters of the enterococcus present might be of importance. The usual history of such cases was first an infection with Flexner's bacillus or with *Entamoeba histolytica*, associated with a mucous colitis rather than with dysentery; then a secondary invasion of the ulcers by a hæmolytic streptococcus, which often abolished the primary infection but kept up the irritation. These streptococci next invaded the blood stream and might cause anaemia, lesions in muscles, nerves, or connective tissues—also, quite possibly in the eye. They could often be isolated by taking a catheter specimen of the patient's urine and incubating it, without any culture medium, in a flask for 48 hours. Hæmolytic strains



appeared to be of importance, whereas non-hæmolytic strains appeared to be part of the normal flora of the intestine.

The meeting terminated at 7-20 p.m.

### PHILIPPINE SOCIETY OF PARASITOLOGY, MANILA.

We have been asked to publish the following note regarding the newly organised Philippine Society of Parasitology in our columns.

Realizing the importance of parasitology in the Philippines, a group of workers organised in Manila on August 20th, 1930, the Philippine Society of Parasitology in order (1) to encourage interest and research, and (2) to acquaint the members of the Society by means of informal papers and discussions with the activities of the local workers, in parasitology. The following were present in the meeting: Major Joe St. John, member, U. S. Army Tropical Medicine Research Board; Dr. Paul F. Russell (President), Rockefeller Foundation; Dr. Justin Andrews, Dr. Walfrido de Leen and Dr. Lamberto Leiva, University of the Philippines; Dr. Cristobal Manalang (Vice-President), Philippine Health Service; Dr. Otto Schohl and Dr. Marcos Tubangui (Secretary-Treasurer), Bureau of Science; Mr. Atherton Lee, Philippine Sugar Association; and Mr. Gonzalo Merino, Bureau of Plant Industry.

## Current Topics.

### Studies on Sprue with Special Reference to Treatment.

#### Based upon an Analysis of 200 Cases.

By PHILIP MANSON-BAHR,

and

HUGH WILLOUGHBY.

(Abstracted from *The Quarterly Journal of Medicine*, July, 1930, p. 411.)

#### Conclusions.

It is realized that the conclusions which we have arrived at as the result of this protracted study of our clinical material are somewhat theoretical in nature, but we consider that we have at our command a legitimate substratum of facts for doing so, and we state them merely as forming a basis for future work:—

(1) That sprue has a wide geographical distribution throughout the tropics and subtropics between the latitudes of 40°N. and 20°S. of the Equator; that, in fact, it has a more northerly than southerly range.

(2) That wherever it occurs it is a disease specially liable to affect Europeans and that it is prevalent in them the nearer the Equator is approached; but that in its distribution it tends to miss the whole of the Central African Continent.

(3) That wherever it occurs in widely separated localities the nature and symptoms of the disease are identical. Sprue is therefore a disease *sui generis*.

(4) That the European victims of sprue are those who for the most part are living in close contact with natives of the endemic area of the disease.

(5) That in certain countries where it is prevalent it occurs with greater frequency in certain definitely restricted zones, such as the cities of Bombay and Colombo and the Treaty Ports of China.

(6) Although sprue in native cases is rare, yet it can be recognized in Indians by its unmistakable signs, and it is possible that it exists in other races to an extent not recognized in a larval and less easily detectable form.

To our minds these facts point to the probability of sprue being an infective condition contracted from the native population which, as in the case of other well-known tropical diseases, may harbour the infection.

The conclusions are supported by the following consideration:—

(a) Sprue has a definite incubation period.

(b) It is subject to definite periods of latency and recrudescence.

(c) There is evidence of a specific inflammation ranging through the whole intestinal tract and affecting principally the processes of digestion and assimilation. The nature of the virus may be ultramicroscopic and of a low grade specificity which can only be acquired in the tropics under certain definite conditions and from long contact with native races.

(d) We must assume that the virus is capable of lying dormant in a larval form in the human body for a number of years, and in this manner we may explain the manifestations of sprue symptoms many years after quitting an endemic zone of the disease.

(e) There is evidence that recovery from the disease depends to a great extent upon restoring the functions of absorption.

(f) That the anæmia of sprue is dependent in the first instance on the destruction of the intestinal mucosa and the lack of nutrition of the tissues thereby entailed, while the cure of the anæmia is followed by amelioration of the intestinal symptoms and generally by an increase in the power of absorption, probably by augmenting the general blood supply and nutrition of the bowel wall.

(g) There is evidence that cases of sprue of the more severe type with high grade anæmia and bowel symptoms are completely restored to health whenever the blood picture is restored to normal as by blood transfusion. This in turn leads to an apparent cure of the bowel symptoms in cases which have now been observed over a number of years.

(h) The cure of sprue depends upon the administration of a nutritious and easily-assimilable dietary with the addition of protein and liver in order to stimulate the hæmopoietic functions of the bone marrow.

### The Influence of Blood Groups in Malarial Transfusions.

By E. M. KNIGHTS, R.H.D.

(Abstracted from *The Journal of Laboratory and Clinical Medicine*, Vol. XV, No. 10, July, 1930, p. 980.)

DURING the year 1928, F. J. Farnell, psychiatrist for the Providence City Hospital, while treating cases of general paresis with injections of human blood containing malarial parasites, noticed that the period of incubation of malaria in the recipients varied and in some instances a single injection of from 2 to 5 c.c. of "malarial blood" failed to induce malarial symptoms in the recipient. Furthermore two paretics receiving blood from the same donor at the same time often differed widely in the incubation periods of their malarial symptoms.

Following a discussion of this situation the author asked for permission to type the donors of malarial blood and the recipient paretics, to prepare stained smears of the donors' blood and to prepare smears of the blood of the recipient paretics from time to time.

Early in our study it became evident that the question of blood groups was an important factor in determining the incubation period for malaria after the transfusion of small quantities of malarial blood.

*Plasmodium vivax* of benign tertian malaria was being used for this work and it is an accepted theory that in man the only time that the parasite is found free from the erythrocytes is during that stage of schizogony when the schizont ruptures and the merozoites migrate to fresh erythrocytes.

If, due to an incompatibility of blood groups between donor and recipient, there is agglutination and lysis of the donor's red cells it is probable that only those malarial parasites which are in the merozoite stage and ready to infest new erythrocytes may survive. If, on the contrary, the donor and recipient are in the same blood group or in such a relationship that the erythrocytes



TABLE II.—150 diabetic deaths.  
A. Non-coma deaths (91).

Cause of death.	Cases.	Percentage of all deaths.	Average age.
Senility .. ..	8	5.3	73.4
Gangrene .. ..	8	5.3	66.0
Arterio-sclerosis and heart failure .. ..	11	7.3	63.7 *
Cerebral hæmorrhage ..	15	10.0	61.8
Chronic nephritis ..	1	0.7	57.0
All cardiovascular ..	43	28.6	65.1
Respiratory infections ..	9	6.0	59.5 †
Acute abdominal sepsis	4	2.7	59.5 †
Septicæmia .. ..	2	1.3	70.0
Erysipelas .. ..	1	0.7	38.0
Cellulitis .. ..	1	0.7	26.0
All sepsis (non-coma)	17	11.4	57.5
Tuberculosis .. ..	11	7.3	55.4
Malignant disease ..	13	8.7	59.5
Pernicious anæmia ..	2	1.3	43.0
Peptic ulcer—hæmatemesis	2	1.3	36.5 §
Acromegaly .. ..	1	0.7	62.0 ¶
Hæmochromatosis ..	1	0.7	27.0
Accident .. ..	1	0.7	30.0
Total non-coma ..	91	60.7	59.0
B. Coma deaths (59).			
Breaking diet .. ..	21	14.0	38.4
Gastro-intestinal upset ..	9	6.0	36.9
Focal sepsis .. ..	7	13.3	36.0
Respiratory infections ..	13		40.7
Hæmatemesis .. ..	1	0.7	25
Unspecified coma ..	8	5.3	32.7
Total coma .. ..	59	39.3	37.4
All deaths .. ..	150	100	50.5

\* 1 myxœdema. † 1 with parotitis; 1 acromegaly.  
‡ 2 appendicitis; 2 peritonitis. § 1 with carbuncle.  
¶ 1 also died of influenza.

Deaths from coma followed non-surgical gastro-intestinal upset in nine cases. In all but one of these the preceding treatment had been entirely satisfactory. The fatal illness in these cases came on suddenly and was of short duration. It was characterised by nausea and persistent vomiting, usually accompanied by intense abdominal pain and sometimes by diarrhoea. Symptoms of this sort may occur as the result of ketosis in diabetes, but in these cases we believe that pro-enteritis preceded the onset of the coma.

One group of eight cases coma is given as the death without mention of any precipitating

recovery is often possible. Although favourable when properly managed, these cases require careful supervision in order to avoid trouble. It is essential for them to follow a strict regime, for the dangers of relaxation of effort are greater in them than in diabetics over middle life. Sepsis, gastro-intestinal upset, and major errors of dieting, all tending to development of acidosis, are the dangers especially to be feared. Acetonuria and coma are readily produced in this type of case, but should be absent under adequate treatment or, where developed, should be controlled by insulin, death being thereby avoided. In this "toxic" type the patients may be somewhat under weight, but are usually otherwise healthy. Degenerative processes are absent and there is no history of obesity. The sex-incidence is about equal in patients under the age of 45 (26 males, 22 females), as we have already shown in the thin subjects and those dying of coma.

The second group of diabetics is distinguished from the first in several ways. As a whole, the patients are older; indeed, many might be regarded as long-lived. The diabetes of later life has long been recognised as mild in type and little liable to the complications found in younger cases. Usually it appears insidiously, the first sign being gangrene, eye trouble, or pruritus. The progress of the disease is slow and there is little tendency to acidosis. Amongst the outstanding features of this group are the prevalence of arterio-sclerosis, the occurrence of obesity, and the preponderance of females. The grossly overweight individual is commonly regarded as a potential diabetic, and it may be that the metabolic disturbance which leads to obesity is closely related to that in diabetes. This form of obesity is more common in women and leads to high blood pressure and often to arterial damage. The high incidence of arterio-sclerosis in diabetes is usually regarded as evidence that it depends on the metabolic disturbance, but it is equally possible that the relationship is just the reverse. From a study of this type of diabetes it is our impression that the insidiously progressive vascular disease occurs first and leads to pancreatic degeneration in much the same way as it affects the kidneys. The mildness of this type may in some degree be due to the slower development of the lesion and to a gradual adjustment of the body to the altered conditions. Patients who suffer from this "degenerative" type of diabetes do not die from coma but from some other cause, often vascular. Like the other group, however, these patients also show a lowered resistance to infections, and under the influence of these the diabetes may become more prominent.

It will be observed that amongst the non-coma deaths there are a few who do not conform to the "degenerative" type. These include the patients who died of erysipelas (aged 38), cellulitis (26), hæmatemesis (29 and 44), one pernicious anæmia (29), the accident case (30), and possibly also the hæmochromatosis (27). In some of these cases death probably occurred too rapidly to allow the development of coma. When allowance is made for these cases, the average age of death of the non-coma patients is raised from 59.0 to 62.1 years.

### Avertin Narcosis.

By GEORGE EDWARDS, M.R.C.S., L.R.C.P.

(Abstracted from *The Brit. Med. Journ.*, October, 1929, No. 3589, p. 713.)

AVERTIN is tribromomethylalcohol, a white crystalline solid. It is soluble in water to the extent of 3½ per cent. at body temperature. When heated above 40°C. or exposed to light for long it decomposes into dibrom-acetaldehyde and hydrobromic acid. The former substance is extremely irritating to the bowel; the hydrobromic acid is readily observed by its reaction with Congo red reagent and provides a ready and necessary means for testing the purity of avertin solutions.

Introduced into the rectum avertin is readily absorbed from its solution. It is excreted almost entirely by

the liver and kidneys, and appears in the urine in combination with glycuronic acid. As much as 81 per cent. of the dose given has been recovered from the urine.

The anæsthetic properties of avertin are best indicated by the fact that the chemical manufacturers now call it "the basal narcotic." Full surgical anæsthesia can be obtained, and is occasionally obtained by avertin alone, but the variation in depth of anæsthesia produced by similar doses on different patients is so great that one cannot set out definitely to produce anæsthesia solely by this method. Once a patient is narcotized with avertin, only a very small quantity of inhalation anæsthetic is required to complete the anæsthesia. From the anæsthetist's point of view this is the chief merit of the drug. The patient has much more cause to welcome it. The anæsthetic is given in the ward without fuss, the falling asleep is gradual and peaceful, and the awakening equally so. Even though the narcosis has been very light, there will be no memory of anything from the time of the injection. Further, the events of the next twenty-four or thirty-six hours will not be remembered with any clearness, and the whole horrible business of being anæsthetized and of recovering is thus not only diminished in fact, but is minimized in retrospect. The merits of avertin narcosis are, in short, those of rectal anæsthesia combined with those of deep preliminary and subsequent narcosis.

Avertin is found to be of particular value in dealing with highly nervous patients, with cases of Graves's disease, and, I am told, with children. In patients with respiratory affections it largely reduces the amount of inhalation anæsthetic required, or may enable the operations necessary to be carried out under local anæsthesia.

In teaching, light avertin narcosis has been used in demonstrating patients to classes. It has been the case that the patients are not sensible of their exposure, and that the true pain reflexes persist whilst the functional element is obliterated, so that a much more accurate diagnosis is possible. For obstetric purposes, avertin was at first said to be unsuitable, owing to its paralyzing action upon plain muscle. However, reports vary exceedingly.

The conditions in which avertin is contra-indicated are such as one would expect from its method of absorption and excretion. All inflammatory and ulcerated conditions of the rectum and colon rule it out. Cases with severe renal and hepatic lesions should not be given avertin, although nephrectomy has been performed and cases with severe jaundice have been operated upon under it. Acidosis, advanced cachexia, and serious blood diseases are also given as contra-indications. Recent work in Germany\* shows that patients with hyperthyroidism can take massive doses of avertin and can eliminate them quickly. This suggests that patients with deficient thyroid secretion will not eliminate the drug, and that one line of treatment in case of delayed return to consciousness would be the injection of thyroxin. Further, in cases where there is doubt as to the advisability of giving avertin, a determination of the basal metabolism may help in coming to a reasoned decision.

The physiological changes in avertin narcosis are a falling of the blood pressure and a decrease in the respiratory movements. No definite changes in the pulse rate have been observed. The fall in the blood pressure is usually within the limits of that observed in deep sleep, between 10 and 30 mm. I have never seen more than this change, and there appear to be no reports of a greater fall which could have been due to the avertin alone. The respiratory centre is affected and a slight cyanosis is usually observed, more particularly in patients who have had preliminary doses of morphine. The breathing is shallow and the rate normal or slightly quickened. Patients vary a great deal in the amount of cyanosis they show; much depends, of course, upon the general condition of the patient, upon the anatomy of the air passages, and upon the dose of avertin they have had. Marked

cyanosis will not occur if the dose has not been greater than 0.1 gram per kilo of body weight, and as long as the airway is kept clear.

The anæsthesia comes on gradually and takes from twenty to thirty minutes to reach completion. The ocular reflexes disappear in the usual way, and with the routine dosage the patients end up with contracted pupils which react to light, with an absent conjunctival reflex, and with no, or only a slight, corneal reflex. There may still, however, be a skin reflex, and pinching the inner side of the thigh or scratching with a needle may cause a movement. A sudden blast of strong ether vapour may produce a cough; this is a useful preliminary test to give one an idea of how much inhalation anæsthetic will be needed. With increasing experience of a routine dosage it is possible fairly accurately to judge what state of anæsthesia has been effected, and to estimate how much pushing of the inhalation anæsthetic will be necessary.

The actual administration of avertin is now a simple proceeding. In the first cases, the weighing out of the requisite amount of powder, the slow dissolving of it in water at 38°C., the testing of the solution, the giving of two rectal washouts before the administration and one after the operation, together with the peculiar anxiety regarding the patient, made an avertin anæsthesia a formidable business. Finding that more often than not a complete anæsthesia did not result, the anæsthetist felt that a great deal of trouble had been taken for no reasonable return. The introduction of a standard concentrated avertin solution ready for dilution has simplified matters, and experience has shown that much lavage of the rectum is not only unnecessary but undesirable, as an excess of fluid in the bowel may interfere with absorption.

The preliminary measures are an enema the night before operation, repeated next morning if it should seem necessary. In emergencies, satisfactory results have been obtained without any preparation of the bowel. Some observers think it good to give a sedative overnight. The desirability of an injection of morphine or of omnopon before the rectal injection appears to be a moot point. Acting upon Dr. Mennell's suggestion, I tried a series of cases with and without omnopon. The difference in the degree of anæsthesia was definite, but the general condition of the patients without morphine was better: respirations were less shallow and there was less cyanosis. As it had been agreed by this time that full anæsthesia was not to be attempted with avertin alone, the omission of the morphine merely slightly added to the amount of ether or chloroform required.

The dosage of avertin is still a matter for discussion; but the general agreement has been that where there is no marked weakness or general infection, 0.1 gram per kilo of body weight is a perfectly safe dose, and this is the dose which is largely used; 0.125 and 0.15 gram per kilo have been used with success, but where there has been trouble it has nearly always been with these high doses. In Germany larger doses still have been tried. I have not been able to get the full results, but am told that cases of Graves's disease stand these doses particularly well.

Avertin is provided in a concentrated solution with amylene hydrate—1 gram in 1 c.cm. The dose works out at between 6 and 8 grams. The appropriate amount of the solution is measured out and enough distilled water to make a 2½ or 3 per cent. solution is heated to 38°C. The avertin is then added and the mixture is shaken till a clear solution results. The most important points are that the temperature must never exceed 40°C. and that the final solution must be free from hydrobromic acid and therefore free from dibrom-acetaldehyde; 5 c.cm. of the dilute solution are taken and a drop of 1 in 1,000 Congo red solution is added. The colour should remain bright orange red. The blue reaction of free acid is sometimes delayed and it is essential to make the test immediately before administration.

The solution being now ready and satisfactory, it is injected into the rectum fairly slowly through a

catheter and funnel. The catheter must be passed well into the rectum proper. The patient is best arranged lying on the left side with a pillow under the pelvis. The 250 or 350 c.cm. of solution are easily retained if the injection takes three or four minutes. Attempts have been made to give fractional doses, running in more solution if the anaesthesia produced by the original dose was inadequate. It has been shown that the avertin in solution is more readily absorbed than the water. This makes all calculations with regard to strength of solution useless, and it is impossible to gauge rate of absorption or to prophesy the depth of anaesthesia which will be obtained. If undue depth should be observed at an early stage, washing out the rectum for the purpose of removing any of the avertin that may remain there is a sound proceeding.

In practice, it seems best to give the rectal injection thirty minutes before the advertised time of the operation. This means that the patient need not be disturbed for twenty minutes, and then may be taken straight to the theatre. During the induction period we have endeavoured to keep the patient quiet, to keep the room dark, and to keep out all sources of irritation. Flessa, however, says that some patients resent strongly the sepulchral atmosphere, and that light and noise have no effect upon the induction, so that it is better to allow the ordinary noise and disturbances to go on normally.

Having taken the patient to the theatre, the anaesthetist tests the skin reflexes, and either starts the inhalation anaesthetic at once or, if a fairly deep state has been achieved, withholds the ether till necessary. Ether, C. E. mixture, chloroform, gas and oxygen, or local anaesthetic may be used. If gas and oxygen be used, one has to wait for a severe stimulus to be given by the surgeon before the patient will breathe sufficiently deeply to take in enough of the gases. The amount of ether and chloroform used will be measured in drachms rather than in ounces. Once a sufficient relaxation has been obtained, it is often unnecessary to give any more of the inhalant. The peritoneum that has been relaxed enough for the abdomen to be opened will remain so for closing, unless the operation lasts so long that the avertin effect is wearing off. The usual duration of the narcosis is from one and a half to two hours from the time of the injection. About four hours from the start the patient is usually quite conscious of his surroundings.

The chief care in the nursing is watching the relaxed jaw and tongue; this applies during the period of induction as well as of recovery. A rectal washout used to be given on return to the ward. This is now considered to be unnecessary. Should the patient's condition demand it the routine saline treatment is carried out.

In only one case have I seen any trouble directly due to an avertin anaesthesia. In this case the patient died twenty hours after the administration of a dose at the rate of 0.125 gram per kilo. It would seem probable that in that case a deficiency of thyroid secretion had diminished the patient's power of detoxicating and eliminating the drug.

The lines of treatment in cases of prolonged delay in return to consciousness are respiratory stimulation by injections of lobeline, the giving of carbon dioxide and oxygen mixture, and injections of ephedrine to maintain the circulation. So far as I can discover, thyroxin has not been tried; but this would seem a rational method of assisting elimination.

In conclusion, avertin can be used to provide a deep narcosis, which is easily convertible into an anaesthesia by the giving of very small quantities of the ordinary anaesthetics. It is reasonably safe in doses up to 0.1 gram per kilo of body weight. It eliminates nearly all the mental stress which accompanies the usual administration of an anaesthetic. It has no effect upon the respiratory tract. It is well taken by persons with excessive thyroid secretion. It is fairly easy to give.

On the other hand, it is not controllable and cannot safely be used as the sole anaesthetic agent. It has to

be prepared with care. It should not be used where there is any disease of the kidneys, liver, or colon, or where there is thyroid deficiency. It is not, as was at first hoped, an anaesthetic that anybody can give at any time. It requires an experienced anaesthetist to control the superimposed anaesthesia. The necessity of giving the injection half an hour beforehand adds to the anaesthetist's duties and makes its use difficult in hospital practice where cases follow each other with rapidity.

In certain cases and types of patients avertin is a great help. As a routine anaesthetic agent, it is hardly practicable.

### Muscle Extract in the Treatment of Angina Pectoris and Intermittent Claudication.

(Abstracted from *New York State Journal of Medicine*, Vol. 30, No. 13, July 1st, 1930, p. 773.)

LED by the report of J. S. Schwartzman of Odessa on the treatment by muscle extract of angina pectoris, particularly of the variety known as "angine d'effort" or angina ambulatoria, M. S. Schwartzman has employed this method with very promising results. The underlying considerations on which the administration of muscle extract is based are as follows: J. S. Schwartzman, in 1927, described a peculiar phenomenon which occurs invariably with a hypotonic heart muscle, as in infectious diseases, anaemia, cachexia, chronic pulmonary tuberculosis, heart failure, etc. If the patient contracts any muscle group, there are noted a muffling of the heart sounds, shortening of the systole, diminution of intensity, or even disappearance, of systolic murmurs, if any have been present; all this being the result of a diminution of the amplitude of the cardiac contraction. This heart reflex bears a certain resemblance to what happens in angina pectoris, in which the coronary angiospasm might be accompanied by muscular spasm. It has been observed that a few preliminary exercises would abolish the phenomenon, and the fact is known that anginal pain sometimes disappears if the patient continues his effort. Hence arises the assumption that some antispastic substance is at work during the contraction of active skeletal muscle, and that such substances obtained from the skeletal muscle of a healthy young animal might counteract the spasm in angina pectoris. Their deficiency in the muscular system, on the other hand, would be an important factor in the production of the anginal syndrome. The author reports an illustrative case of angina ambulatoria treated by daily injections of muscle extract for three weeks. After the third injection there was an improvement in sleep; after the sixth injection the sensation of constriction about the chest diminished, and after the twelfth injection the patient was able to walk two and a half miles without discomfort. In view of the striking resemblance of angina pectoris to intermittent claudication, the treatment was applied to cases of the latter condition with encouraging results. *British Medical Journal*, May 10th, 1930, i, 3618.

## Reviews.

**TAYLOR'S PRACTICE OF MEDICINE.**—By E. P. Poulton, M.A., M.D. (Oxon.), F.R.C.P. (Lond.). Fourteenth Edition. London: J. & A. Churchill, 1930. Pp. 1075 plus xvi with 64 plates (12 coloured and 103 text-figures). Price, 25s. net.

TAYLOR'S *Practice of Medicine* occupies a place that is distinctively its own in the ranks of textbooks of medicine. This distinctiveness is due to the fact that it deals not only with the full range of subjects connoted by the term "practice of medicine" but also with three specialities to which separate textbooks are ordinarily devoted, viz., clinical methods, psychiatry and dermatology. The present edition is the fourteenth

(the first was published as long ago as 1890) and it is under the general editorship of Dr. E. P. Poulton with the assistance of Drs. Putnam Symonds, H. W. Barber and R. D. Gillespie.

The book opens with a section on infectious diseases including therein a subsection on infectious diseases of the tropics; attention may usefully be directed to one or two points. The statement (on p. 12) that "the action of agglutinins is not absolutely specific" will probably meet with general acceptance, but we do not think that the sentence following should be allowed to stand without qualification—"Thus the typhoid agglutinin will clump not only the *Bacillus typhosus*, but also the paratyphoid bacilli and the *Bacillus coli*." In the first place the typhoid bacillus and the colon bacillus are antigenically so dissimilar that the occurrence of the phenomenon indicated in the sentence quoted is distinctly a rarity. Secondly, attention is in practice always paid to the titre of agglutination, and the organism for which the agglutinin content of the serum is *ultimately* highest is in all likelihood the one responsible in any given case. Incidentally, the organisms causing paratyphoid fever are not two in number (p. 76) but three; the C strain is generally accepted in modern textbooks. While the season of maximum prevalence of diseases like diphtheria and cerebro-spinal fever is noted, corresponding information regarding the equally important diseases scarlet fever and measles is omitted. We notice also that the frequency of occurrence of the main complications of the various infective fevers is gauged by analysis of the figures of the Metropolitan Asylums Board's hospitals for 1914. If any later figures are available it would be interesting to have them, particularly in the case of a disease like scarlet fever, the treatment of which is on a much more satisfactory basis than it was sixteen years ago. The list of references to articles on infectious diseases as a whole is placed at the end of the subsection on tropical infectious diseases, an arrangement which causes slight confusion until one gets used to it. The hyper-critical may possibly comment unfavourably on a certain lack of uniformity in the reference-making, for while some workers are referred to somewhat curtly by their surnames only, others, more fortunate, are credited with at least the initial letters of their Christian names.

In the tropical subsection we confess our complete inability to guess the *raison d'être* for the arrangement of the various paragraphs. The subsection opens with a short description of yaws, surely not one of the major tropical maladies, followed by leprosy, admittedly an important disease, followed in its turn by melioidosis, which is a distinct rarity. We are rather curious to know why Madura foot is described as *the* fungus disease of India (italics ours) and why should the causal organism of Weil's disease be referred to in one place as *L. hæmorrhagiae* and in a subsequent paragraph as *L. icterohæmorrhagiae*? The tropical subsection as a whole has in fact a rather uneven contour. For example, three pages are allotted to relapsing fever, kala-azar gets roughly one and a third, while sprue is put on distinctly short rations with half a page, not in the tropical subsection but among the diseases of the intestine.

We were particularly interested in the descriptions of diseases of the blood, spleen and lymphatic system; this section has the merit of being embellished with a series of coloured plates which are really illustrative. We missed, however, any reference to Eve's halometer, an instrument which is finding favour among clinicians despite the fact that its accuracy in the absolute sense is rather marred by the introduction of the personal equation. Digestion leucocytosis (referred to on p. 518) is a phenomenon the occurrence of which has hitherto received wide credence—recent work by Garrey and Butler in America, however, seems to show conclusively that the phenomenon in question is a myth.

The section of the book devoted to diseases of the urinary organs maintains a high level of general

excellence, but we scent a possible inconsistency in the statement (on p. 587) that "it is wiser and simpler to plead ignorance than to perpetuate an unexplained pathology," followed at a relatively short interval by two and a half pages on a discussion of a provisional theory of the pathology of Bright's disease. Morbid anatomy in fact seems to us to bulk rather largely in the consideration of the various types of nephritis; by the time the clinician (as opposed to his colleague the pathologist) is able to satisfy himself by ocular demonstration regarding the exact morbid anatomy of the kidneys of any given case his interest in that case is mainly academic. The statement (on p. 619) to the effect that hypernephromas are probably tumours of renal origin is contrary to a large body of well-informed opinion. Wells, for example, analysed the lipid content of these tumours and found it to approach that of normal adrenal cortex.

Of definite errors (as contrasted with mere questions of difference of opinion) we detected relatively few and these largely of printing-room origin. On p. 7 (line 8) "posses scilicet" is puzzling until one realises that the terminal "S" of possess has gone astray. A reference on p. 140 to plate 1B revealed that the plate in question (in our copy of the book at least) is not divided into areas A, B, and C. Kala-azar is undoubtedly an important disease but it does not require a capital K when it occurs in the middle of a sentence; incidentally we are advised (p. 143) that this disease occurs in India and Assam (italics ours). Leishmania as a whole is in fact rather badly treated for in addition to the afore-mentioned troubles it has (at p. 953) acquired an illegitimate "n"—Leishmnania. When one reads at p. 404 that "The samples are titrated with deci-normal NaOH solution, using dimethyl as an indicator" one is tempted to ask "Dimethyl what?"; here the correct answer is probably dimethyl-amido-azo-benzol. Following instruction on p. 596 one turns back to plate 8 in order to refresh the memory regarding the appearances of optic atrophy; plate 8, however, proves to be a very good radiogram of the chest showing secondary deposits of new growth in the left lung. There are several other small errors such as *B. ærtryche* for *B. ærtrycke* at p. 443, "dorsæ" for "dorsal" at p. 673, the omission of the words "of" and "the" between "sole" and "foot" at p. 700, peccalodiles for peccadilloes at p. 851 and the dropping of an "h" from ophthalmoscopic at p. 871.

These criticisms, at times confessedly niggling, may convey the impression that Taylor's *Medicine* is not all that a standard textbook should be. This is certainly not so; a textbook that has consistently maintained itself in favour with the medical public for nearly half a century must have kept an equally consistent level of excellence and the present edition can challenge comparison with its predecessors in this respect. For example, the section on diseases of the nervous system, especially that part devoted to anatomy and physiology, is the most lucid exposition of the subject that we have encountered for some considerable time. Mental diseases, admittedly a difficult subject from every point of view, are succinctly dealt with. About ten pages at the end of this section are given over to a discussion on legal relationships; this subsection is very timely in view of the series of rather notorious actions for alleged wrongful certification that have occupied the attention of courts of law in England during the past few years. Dr. H. W. Barber is responsible for the chapters on dermatology; aid is given to the understanding of this rather complex subject by the inclusion of several good colour plates.

The authors have been extremely fortunate in their publishers; printing and binding are excellent and the price (twenty-five shillings) is distinctly reasonable. We have only one criticism to offer; we think that the insertion of sixteen pages of publishers' advertisements at the end of the book detracts in some measure from its dignity.

**GENERAL PRACTICE (SOME FURTHER EXPERIENCES).**—By Ernest Ward, M.D. (Camb.), F.R.C.S. London: John Bale, Sons and Danielsson, Ltd., 1930. Pp. 108. Price, 3s. 6d. net.

This is a companion volume to "Medical Adventure" by the same author. In "Medical Adventure" the author compounded sound advice and much useful information on matters which often perplex the practitioner, with descriptions of unusual cases and uncommon ailments. In "General Practice" further experiences are related and told with humour and force. The author has a great fund of common sense and a broad outlook on life. In this book he deals with the selection of a practice, matrimony, the day's work, the patient, colleagues, finances, exceptional cases and unorthodox treatment. He has much of interest to say and he says it humorously and well. It has much practical wisdom and sound advice in it and there are few medical men who will not be benefited in some way by having read it.

J. D. S.

**INFECTIOUS DISEASES AND OTHER FEVERS IN INDIA: A MANUAL FOR STUDENTS AND PRACTITIONERS.**—By P. T. Patel, M.D. (Lond.), M.R.C.P. (Lond.), D.T.M. & H. (Cantab.), F.C.P.S. (Bom.). Calcutta: Butterworth and Co. (India), Ltd., 1929. Pp. xiv plus 784. Price, Rs. 10.

THE magnitude of this subject can be seen from the *Annual Reports of the Public Health Commission for India* in which in the year 1925 alone there were about 6 million deaths due to fever. Besides the figure for deaths, more than 100 million persons suffer from ill health as a result of repeated attacks of various kinds of fever and thus cause enormous economic wastage to the country. There are undoubtedly some kinds of fever in India, the aetiology of which we do not know. With the establishment of special hospitals for the treatment of fever in charge of expert staffs progress in the aetiology may be made. There is here a field for work for a good many workers, and a large number of books recording the experience in this branch are necessary to cope with this urgent problem. So this book is very welcome and especially so as it consists mainly of clinical and bed-side experience of such a well known expert as Dr. Patel, who has made the subject of fevers and infectious diseases his life-study. The reviewer is surprised to find that in the description of yellow fever the author is still ascribing the aetiology to *Leptospira icteroides*. Students of modern medicine know well that there is no such organism as *Leptospira icteroides* and that yellow fever is caused by a filterable virus of unknown morphology. The book is strongly recommended, in spite of such minor defects, to students and practitioners in India for its most useful information on the management of the most important infectious fevers of the country.

S. B.

**THE TREATMENT OF DIABETES MELLITUS WITH HIGHER CARBOHYDRATE DIETS.**—By W. D. Sansum, M.S., M.D., F.A.C.P., P. A. Gray, Ph.D., M.D., and R. Bowden, B.S. (Black's Medical Series.) London: A. & C. Black, Ltd., 1930. Pp. vi plus 309. Price, 6s. net.

THIS book seeks to record the experience of the authors, extending over nearly four years, in trying to use a standard diet for diabetic patients which is much higher in carbohydrate content and lower in fat content than the present average standard.

The authors maintain that in using a diet for diabetic patients which more or less approximates to the standard for normal people, many of the usual complications of diabetes such as arterio-sclerosis, high blood-pressure, heart and kidney diseases could be obviated. In the opinion of the authors, the abnormal dietetic conditions to which diabetic patients are subjected are responsible for these complications.

The conclusions arrived at by the authors as a result of these investigations are:—

(a) That practically all patients felt physically stronger and mentally more alert.

(b) That high blood-pressure complications were satisfactorily avoided.

(c) That children developed normally and showed a steady and progressive increase in tolerance.

We recommend the book to the general practitioner with the caution that the instructions given in the book should be carefully studied and the reservations borne in mind, and that in following the instructions, care should be taken to give as large a margin as possible to the different conditions of life, climate and habits to which the patient is subject. It is our hope that further study may reveal that the experience of the authors is a distinct step in advance in the treatment of diabetes mellitus.

J. P. B.

**LIVER IN THE TREATMENT OF PERNICIOUS AND OTHER ANÆMIAS.**—By S. C. Dyke, D.M. (Oxon.), M.R.C.P. (Lond.). London: Jonathan Cape, 1930. Pp. 128. Price, 5s. net. Obtainable from Butterworth and Co. (India), Ltd. Price, Rs. 3-12.

THE use of liver in the treatment of pernicious anæmia arose from experimental work on diet in this disease. The work was commenced in America, the home of dietetics, in 1923 by Minot and Murphy. In their original paper 45 cases were described and in spite of excellent results they viewed their work with a cautious and healthy scepticism. The scepticism was, however, unnecessary and further experimental work by them and others gave results surpassing all expectations. Later and wider experience confirmed all this, and liver extracts are now firmly established as specific in the treatment of all cases of uncomplicated pernicious anæmia. The author of this small handbook is to be congratulated. He has the facile pen of a ready writer, so that the reading of the book is a delight. He has marshalled his facts in a masterly and effective way. In the editorial note it is pointed out that over fifty years ago liver was much in vogue as an article of diet because it was "good for the blood." We have travelled a long way since those days, but we are yet uncertain as to the nature of the curative principle. Vitamin E was at first given credit for the results, but Minot, Murphy and Cohen soon showed that such was not the case, and that large amounts of vitamin E were entirely without effect in the disease. After discussing the various possibilities the author adopts as most likely the view that the active principle is a hormone, that it is formed during digestion in the stomach (probably by the agency of hydrochloric acid) and is stored in the liver. Here it is given out as required. The fact that kidney tissue is efficacious also, but to a lesser degree, in causing blood regeneration seems to support this view. The author's conclusions regarding the aetiology of pernicious anæmia are as follows:—

(1) It is due to the faulty formation of red blood cells, the actual abnormality consisting of failure to reach maturity.

(2) It is always associated with achlorhydria.

(3) The faulty formation of blood may be rectified and the red cells induced to come to maturity by the ingestion of a substance found in liver and to a lesser extent in the kidneys.

(4) The same or a similar substance is developed in the normal stomach in the course of the acid digestion of beef muscle.

The book is a fascinating résumé of recent knowledge and the theory on blood regeneration in pernicious anæmia. It contains a mine of knowledge. Many pitfalls in the treatment by liver are disclosed and the book should have a great influence in making the treatment of the disease by liver more rational and less empirical than it is to-day. Failure in the treatment of this grave malady by liver or liver extracts should be almost unknown.



The book appears in the "Modern Treatment" series. It can be confidently recommended to physicians and surgeons alike.

J. D. S.

**INSOMNIA: AN OUTLINE FOR THE PRACTITIONER.**—By H. Crichton-Miller, M.A., M.D. (Edin.-Pavia). London: Edward Arnold & Co., 1930. Pp. xi plus 172. Price, 10s. 6d. net.

INSOMNIA is a symptom that is found in many organic diseases and disturbed psychological conditions. Even in its mildest form it is distressing, and when prolonged it will overshadow all other symptoms and cause life to become a burden and a misery.

This being so, it is a matter of great importance that the physician should have a practical knowledge of the causes of sleeplessness and the modern methods that will help him to treat the many cases which will come under his care.

Dr. Crichton-Miller has written a book that will be of great help to those who have not specially studied this subject, and who wish to know more of the causes and treatment of insomnia than is to be found in the textbooks.

The physiology of sleep, so far as we understand it, is discussed, but it must be admitted that none of the numerous theories of the causation of sleep is entirely satisfactory.

The causes of insomnia are many. It is easy for us to understand those due to pain or heart failure or acute mental distress. But these are in a minority. There are causes which do not appear on the surface but which approach the psychological side of medicine, although they may not require the specialist in psychology to elucidate and treat them.

In a chapter on "General Considerations" Dr. Miller discusses this aspect of the subject.

Treatment is divided into three sections: general, medicinal, and psychotherapy. All are important and in most cases of insomnia the three methods must be employed.

Medicinal methods are very well described. There are excellent notes on the various hypnotic drugs but it is not merely a matter of giving a definite dose of a certain drug. There are many more considerations involved if the physician is to gain his object. "Not to ensure a few nights' sleep but to re-establish a healthy sleep habit."

The psychological aspect is very important and in many cases psychotherapy offers the only hope of cure.

A large portion of the book is given to this aspect of the subject and the numerous illustrative cases are of great value.

The reviewer does not know of any book that will be so useful to the general practitioner in helping him to understand the modern methods of treating the cases of insomnia that will come to him for advice.

H. H.

**HANDBOOK OF THERAPEUTICS.**—By David Campbell, M.C., M.A., B.Sc., M.D. Edinburgh: E. & S. Livingstone, 1930. Pp. xviii plus 411. Price, 12s. 6d. net. Obtainable from Butterworth & Co. (India), Ltd. Price, Rs. 9-6.

THE author of this small handbook sets out with the thesis that the present-day teaching of medicine is defective, in that it lays too little stress on the all important subject of treatment. The contention is not new, and most writers on therapeutics have dwelt upon the point. We doubt, however, if the compression into a small space of a very large number of therapeutic measures, of which only a cursory description is given, is likely to be of great value to the student or junior practitioner. It may be useful from the point of view of examination knowledge, but hardly from the point of view of actual treatment. When it comes to the latter, it is attention to detail that matters and that makes all the difference between success and failure. As a case

in point we find that filariasis, leishmaniasis and trypanosomiasis are dealt with in the space of two pages. The statement (in connection with kala-azar) that "beyond the isolation of the sick and the disinfection of fomites it is impossible to recommend an efficient prophylaxis," is hardly in accordance with modern knowledge. The book, however, will undoubtedly fulfil a useful purpose in presenting a résumé in a small space of modern treatment and therapeutic measures and as such can be recommended to students and junior practitioners alike.

J. D. S.

**SEIFERT AND MUELLER'S PHYSICAL AND CLINICAL DIAGNOSIS.**—By E. Cowles Andrus, M.D. London: J. B. Lippincott Company, 1930. Pp. 543, with 140 illustrations and 3 coloured inserts. Obtainable from Butterworth & Co. (India), Ltd. Price, Rs. 18-12.

IN addition to its importance as an exposition of Continental clinical methods, this book has an historic interest. It was first prepared many years ago by Drs. Seifert and Müller on the suggestion of Carl Gerhardt, who, with Senator and von Leyden, was the successor at the Charité in Berlin of the nineteenth century giants Virchow, Traube, von Frerichs and Schönlein. An English translation of the twenty-fourth German edition has been undertaken by Dr. Cowles Andrus of Johns Hopkins University. The result is, on the whole, satisfactory. It may be objected that the translator has in places yielded to the not unnatural temptation to interpolate personal variations on the original theme, but this is so skilfully done that the value of the book is actually enhanced thereby. The various aspects of the subject are treated on conventional lines and any criticisms we have to offer are directed to minor points only.

At p. 24 the diagrams of the larynx are drawn as seen *in the mirror*, hence the various structures are transposed; it might be well to mention this fact in the text. At p. 57 pulmonary infarction secondary to disease of the mitral valve is not recorded among the causes of hæmoptysis. Rogers' method of estimating the specific gravity of the blood is much simpler than the use of the Schmalz' capillary pyknometer (p. 130) and is sufficiently reliable for most clinical purposes. At p. 209 the chemical formula for the monosaccharides is given as  $C_6H_{12}O_6$  instead of  $C_6H_{10}O_6$  and we are not prepared to accept the statement on p. 238 that "with general paresis the Wassermann reaction may be negative in both blood and spinal fluid...."; neurologists are in practically unanimous agreement that a reliable technique will show a hundred per cent. positive Wassermann reactions in the cerebro-spinal fluid in untreated cases of this disease.

We confess that our previous impressions of the lengths of cestodes underwent a violent modification when we read, at p. 285 that "*Tænia solium* = pork tape-worm is 1-3 mm. long"; the same remark applies *pari passu* to the lengths of the other cestodes as given.

Other controversial points may be briefly summarised:—*B. tetani* is described as being Gram-negative; papatassii fever is stated to be transmitted "by a flea" and dengue by *Culex fatigans*. Encephalitis lethargica is not included in the list of diseases of the central nervous system in which moral defects may bulk largely, and the important feature of Korsakoff's syndrome is that it is characterised not only by "a loss of memory for recent events" but also by *confabulation*, the patient giving circumstantial accounts of events which are entirely figments of his imagination. With hemisection of the spinal cord deep sensibility is lost upon the same side as the lesion, not upon the opposite side.

Spelling errors are too frequent and "vesicle calculus," "monometer," (for manometer) "axilli," "flagelli," "*N. medianis*" and "a nuclei" are solecisms which detract from the general merit of the book. The four colour plates are good but the same remark cannot,



As a whole and as a reference book to the surgeon or general practitioner, it leaves little to be desired. To the student, several small paragraphs exhibit too much levity for a textbook supposed to be imparting exact information, e.g., on p. 36 "Though scopolamine is much used, I fear it. I have seen patients sleep too long; far too long." The reader is left guessing as to whether death has occurred or only a narcosis for a frightening length of time.

The anatomical nomenclature is mixed and apt to be confusing in parts. Instead of keeping to the now generally accepted Basle nomenclature we get on p. 69 when referring to the trigeminal or fifth cranial nerve, the hybrid term of 'trifacial' nerve. This is apt to be confused with the facial or seventh cranial nerve, and is altogether an undesirable name. On the following page the nerve is called by its correct name, the 'trigeminus'.

The proof-reading has been hurriedly and carelessly done and many inaccuracies were noted, e.g., on p. 132 we get "In cases where the breast tumour has been removed by *paste*" (!) The context suggests that 'in haste' was meant. At least half a dozen other similar mistakes were found.

On p. 269 a method is described for the resection of varicose veins and ulcers under local anaesthesia. This could well be omitted as most surgeons nowadays would never think of excising a varicose vein when the injection method is so eminently successful and easy, and when the vein injections have been done one usually finds that any varicose ulcers will heal by themselves.

In spite of these criticisms it is a good book and is deserving of less faded-looking gold lettering on the back.

A. H. P.

**MINOR SURGERY AND BANDAGING.**—By G. Williams, M.S., F.R.C.S. Twelfth Edition. London: J. & A. Churchill, 1930. Pp. viii plus 445, with 262 illustrations. Price, 10s. 6d. net.

THE appearance of the twelfth edition of *Minor Surgery and Bandaging* by G. Williams is in itself an ample proof of the extensive demand for this instructive little book. It is the most useful book of its kind and because of its convenient size it can be easily carried in the pocket by senior students and house surgeons for ready reference. It is kept up to date with changes scattered throughout the book. Chapters on fractures have been extended and non-operative treatment of the commoner varieties of fractures has been detailed more fully with the help of illustrative diagrams. The injection treatment of varicose veins is well described and the chapter on anaesthetics revised. The book is nicely illustrated throughout and is strongly recommended for the use of students, house surgeons and general practitioners.

B. H. S.

**INTERNATIONAL CLINICS. VOL. I. 40TH SERIES.**—Edited by H. W. Cattell, A.M., M.D. London: J. B. Lippincott Company, 1930. Pp. 309. Obtainable from Butterworth and Co. (India), Ltd. Price, Rs. 37-8 per annum.

*International Clinics*, a quarterly of illustrated clinical lectures and specially prepared original articles on subjects of medical and surgical interest, has now reached its fortieth year of publication. The present volume contains sixteen original contributions; several of these fall within the domain of the specialist but the majority appeal directly to the general practitioner. In the latter group the articles by Brown of Baltimore, Colgan of Philadelphia and Dick of Chicago call for special mention.

The first-named author discusses the treatment of peptic ulcer in a refreshingly rational manner; his plea for a consideration of each case on its merits and for a cessation of the futile polemics of the protagonists of exclusively medical or exclusively surgical measures will not, it is hoped, fall on deaf ears. The diagnosis

of incipient pulmonary tuberculosis is a problem which periodically engages the attention of every practising physician; Colgan's restatement of this problem is most timely. He emphasises the importance of apparently trivial abnormalities such as slight alterations in the breath sounds or slight differences in the relative expansion of the two sides of the chest—early signs too often missed by the physician. Finally we have a comprehensive survey by Dick of Chicago of his work on scarlet fever—a disease on which he is probably the greatest living authority. In the all-too-short space of twenty-six pages there is by far the best account of this subject that the reviewer has yet discovered. If other volumes of *International Clinics* are of equal excellence this is a publication which should find a place in the library of the specialist and of the general practitioner alike.

J. M. H.

**PHYSIOLOGY AND BIOCHEMISTRY OF BACTERIA. VOLS. II & III.**—By R. E. Buchanan, Ph.D., and E. I. Fulmer, Ph.D. London: Baillière, Tindall & Cox, 1930. Pp. xvi plus 709, with 57 text-figures and pp. xv plus 575, with 2 text-figures respectively. Price, 34s. net each.

THESE two volumes on the physiology and biochemistry of bacteria are in continuation of the first volume edited by R. E. Buchanan and E. I. Fulmer. Volume II deals with the effects of physical environment such as temperature, etc., and then the effects of 'chemical environment on these micro-organisms. There is an enormous amount of information on the subject, but it has been put together rather loosely. Volume III deals with the effects of these micro-organisms on their environment. The majority of the changes are of a chemical nature due to various enzymes breaking up the different compounds in the substrate. The action of these organisms on the carbohydrates are dealt with in great detail, while those on the proteins and nitrogenous compounds contain very little information that is of practical use.

Chapter 14 considers the symbiotic relationship and inter-relationship of the enbacterales, and other microscopical organisms as well as the survival of these bacteria in molluscs, insects, etc. These three volumes should be in the hands of every worker who is dealing with advanced bacteriology, as they contain an enormous amount of information on the physiology and biochemical changes produced by these organisms.

We should have liked to have seen the standard of Volume I kept up in Volumes II and III, but we realise the enormous field that these two authors have had to cover, and congratulate them on the result of their labours. The bibliography is very extensive, each of these volumes containing more than 120 pages of references.

H. W. A.

#### CORRIGENDUM.

ON page 467 of our issue for last August, we reviewed some recent publications by Sir Ronald Ross. As some of the books had no price mentioned, we presumed that they were for private circulation. We have since been informed by Sir Ronald that all the books concerned are for sale. They are published by Harrison & Sons, London, and the following is the complete list:—

- (i) *Letters from Rome on Certain Discoveries connected with Malaria*. Price, 7s. 6d.
- (ii) *Two Ross-Manson Letters (1897)*. Price, 5s.
- (iii) *Copies of Letters for Sir Patrick Manson (1899 and 1900) and General Gorgas (1914) to Sir Ronald Ross regarding his Discovery of the Connection between Malaria and certain Mosquitoes in 1897 to 1899*. Price, 5s.
- (iv) *The Mode of Infection; three more Ross-Manson Letters, 1898*. Price, 5s.
- (v) *Memories of Sir Patrick Manson*. Price, 10s. 6d.

## Annual Reports.

### UNITED FRUIT COMPANY. MEDICAL DEPARTMENT. EIGHTEENTH ANNUAL REPORT, 1929. NEW YORK.

This year larger than ever, totalling 451 pages, this volume is as usual packed with valuable information. As we have said before, this series stands alongside of the *Medical Annual* in respect of tropical preventative medicine.

In regard to *malaria*, treatment is the first aspect dealt with, and here we see that the Sinton alkali treatment is not adopted. Calomel and quinine are exhibited together in soda, followed in four hours by magnesium sulphate, after which 15 grains of quinine b.d. are administered together with 1 tablet plasmochin co. (containing 0.01 gm.) each morning and two each evening for the first six days of treatment. After the sixth day the plasmochin is discontinued, and the quinine reduced to 10 grains b.d. An interesting case is quoted, where a really chronic relapse of eighteen years' duration was cured by the heroic dose of 0.12 gm. of plasmochin for six days. An interesting account is given of the routine use of adrenalin chloride in the treatment of the disease. Dr. MacPhail, the author of this paper, still adheres to the intramuscular rather than intravenous route when the quinine cannot be administered *per os*, and states that with him necrosis is practically unknown. Dr. Phelps, whose paper on the same subject follows, shows that using an almost identical routine to that quoted above, he had only 6.3 per cent. of relapses in 586 in-patients in the last six months of the year. This paper is followed by one by Dr. Taylor, who pleads for the use of rectal quininization, 60 grains in olive oil, and gives cases in support of his method of administration. Dr. Whitmore, experimenting on the prevention of gametocyte formation with plasmochin, states that with persons over seventeen years of age he has never seen an oöcyst develop if a single dose of 0.02 gm. (not less than 0.300 mgm. per kilo. of body-weight) of plasmochin was given to the patient after the asexual cycle was controlled by quinine. This is an extremely interesting paper.

The same author has another very valuable contribution, in collaboration with Dr. Roe, on the blood in blackwater fever. Tentative conclusions reached are that in this condition nitrogen retention is generally present.

Following on *treatment*, there are an equally valuable series of papers on *control*. Some years ago the United Fruit Company seemed somewhat pessimistic about the general applicability of anti-larval methods to their conditions. Now, with the general use of Paris green, they appear to regard anti-larval methods as a routine procedure. In spite of difficulties yet to be overcome, we feel that generally oil is ultimately doomed to complete supersession by this substance.

Dr. Clark has a thoughtful little paper on the problem of children in malaria control. With his conclusions we heartily agree, but with the ignorant and undisciplined communities of the tropics nothing but preliminary education of the parents will ever enable us to attack what Clark happily styles the *seed-bed* of the disease.

Komp, Malaret, Maltzberger and Carleton Hale have useful notes in their various papers on Paris green, which must be studied in detail by all using this larvicide. One of Maltzberger's papers, on the preliminary sanitation of the new Chirique division of the Company, is an outstanding example of what can be accomplished in a short period with thorough organization of anti-malarial measures.

To see what has been achieved by all this it is necessary to turn back to the Medical Department's General Manager's preliminary general review of the year's work. In this we see that the average monthly

earnings per head have gone up 25 per cent. by control of malaria in the last three years. As one of the farm superintendents of the Company writes, "We have obtained more working days per man, more stability, and better contentment among them." Could any employer of labour desire more?

Though throughout this report is severely practical, pure science is not altogether overlooked. There is a very valuable paper, with illustrations, on blood parasites of four species of Neo-tropical monkey. Parasites resembling both *vivax* and *malariae* have been found. Another paper, by Robertson of the London School, working on the Company's property, details the finding of a trypanosome morphologically identical with *cruzi* in an opossum.

Passing to other communal diseases, in none of the divisions has the Medical Department been able to incriminate a common source of infection in typhoid, be it in water, milk or other food supplies. The disease is apparently sporadically fly-borne from chance carriers. Ankylostomiasis is now so thoroughly under control that it is no longer looked upon as of primary importance in interfering with economic conditions. The dysenteries remain unchanged in their treatment methods. Beriberi gave trouble in three divisions when green vegetables were difficult to obtain in ample supply, and the condition is discussed in a paper by Dr. de los Reyes, who concludes that there is some other ætiological factor in addition to avitaminosis.

In an interesting paper Dr. James concludes that gout is a disease which is absent from the tropics.

Thonnard-Neumann has an interesting paper on syphilis of the central nervous system in a malaria-infested population. The same author in the previous year's report showed the difficulty of producing febrile reactions in such a population. He gives a series of cases treated with thermic shocks by typhoid-paratyphoid vaccine which will greatly interest those in charge of mental hospitals.

There are numerous interesting papers on individual cases, but one of outstanding importance in the lesson it teaches all of us is "Improper Diagnosis by a Medical Practitioner," by Dr. Aguilar. Dr. Aguilar is brave enough to detail some of his own mistakes in diagnosis, so that "if it impresses upon some of my young fellow-doctors the necessity of using all available resources of medical knowledge, in an endeavour to make a proper and complete diagnosis of each and every case, it will have served its purpose." We do not think Dr. Aguilar can be sufficiently thanked for his frankness, and can only hope that the lessons he has drawn from his own mistakes of omission will be taken to heart by numerous readers. Only the other day we had occasion to examine for certain data the pathological laboratory records of a well equipped divisional hospital. It was seen that during the entire period a few years back that the European M. O. had been on furlough the Indian acting for him had not made a single laboratory examination of any kind of specimen. Words fail us to state what we think of such a procedure, which merits a slashing editorial. Would that we could make the delinquent concerned learn Dr. Aguilar's article by heart.

Those interested in snake-bite will find much to interest them in Mr. George's paper on the work of the snake farm at Tela, with numerous case reports, whilst there is an interesting paper on steamship sanitation by Dr. Gatlin.

There are numerous new and very interesting full page photos of scenes on the Company's properties, mainly of sanitary interest, in addition to the photos of the exterior of hospitals that appear annually.

In conclusion we cannot sufficiently thank Dr. Deeks of the Management of the United Fruit Company for putting, *free of charge*, their annual increment of experience at the disposal of medicine throughout the world. We can only hope that in some way they are required for their public spirit.

R. S. W.

**BENGAL PUBLIC HEALTH REPORT, 1928.** By DR. C. A. BENTLEY, C.I.E., M.B., D.P.H., D.T.M. & H., DIRECTOR OF PUBLIC HEALTH, BENGAL. CALCUTTA: BENGAL SECRETARIAT BOOK DEPOT, 1930. PRICE: INDIAN, Rs. 8; ENGLISH, 13s. 6d.

THE vital statistics of Bengal present a considerable amount of interest, as they reflect so many varied and varying factors. In some places the registration of births and deaths is reasonably good, in others distinctly erroneous; in Eastern Bengal the population is increasing, in parts of Western and Central Bengal it is retrograde; in some districts cholera and malaria exact a large toll of life, in others, the lives lost by these diseases are smaller in number. The resultant picture is therefore difficult to appreciate as a whole but Dr. Bentley gives an analysis of the happenings in each district which gives great value to the report, especially to those who may wish to study the various districts. In the 1921 census 46,522,293 is taken as the basis of calculation: on this the birth rate rose from 27.7 per 1,000 in 1927 to 29.6 per 1,000 in 1928. It is the lowest provincial birth rate in India except that for Burma. The rural birth rate was 30.2 as against an urban birth rate of 20.4. Dr. Bentley however assures us that there is probably 27 per cent. omission and that the birth rate should be 37.3. The provincial death rate was 25.5 per 1,000, practically the same as the previous year, but may be assumed to have been 32.3. The infantile mortality rate was 183.2 against 253.39 in the Central Provinces (the largest in India) and against 121.77 in Bihar and Orissa (the lowest). The natural increase of Bengal was 4.1 per 1,000 as against 21.6 from the Punjab and 14.1 from the U. P. (the highest figures for India).

Rajshahi, Jessore, Hooghly and Chittagong showed an excess of deaths over births; Murshidabad showed the highest birth rate and Calcutta the lowest. Of towns Kurseong recorded the highest birth rate (43.4 per 1,000). Several absurd birth rates were returned, e.g., Dinajpur 6.5, Barrackpore 8.3.

In death rates Dinajpur district headed the list with 34.5, Tippera being lowest with 17.0.

There is a very useful page showing the distribution by districts of total mortality, fever, cholera, smallpox, infant and child mortality.

**Cholera.**—136,245 deaths were returned as against 118,377 in 1927. It accounted for 11.5 of the total mortality, the death rate from the disease being 2.9 per 1,000 out of a total of 27.3. There are two seasonal peaks of cholera in Bengal—in December and April. In 1928 the April peak was much the higher, whereas in 1927 the opposite was the case. It varies inversely with the rainfall occurrence as a rule. Every district in 1928 showed an increase except Bankura, Malda, Darjeeling and Jalpaiguri.

2,304,457 c.c. of vaccine were issued as against 1,299,630 in 1927. 1,941,023 inoculations were reported to have been performed against 781,872 in 1927.

**Smallpox.**—Smallpox killed 43,558 people in Bengal in 1928—the 5 yearly epidemic outbreak was still present. It is hoped that the new rural health organization by which a Sanitary Officer is being attached to each thana will do much to reduce the incidence of this disease.

**Fevers.**—752,003 deaths were reported under this head—a rate of 16.1 per 1,000, a rate higher than the whole death rate of England and Wales. Of the sub-heads malaria returned 368,691 deaths, kala-azar 10,746, and enteric fever 9,297.

**Malaria.**—The seasonal incidence remains typical—the cases rise in June and achieve a peak in November, declining quickly and remaining stationary throughout the hot weather and the rains. Interesting experimental work has been continued at Meenglas, Singaran, Banka Valley and Jangirpur. At Meenglas the splenic index over the whole estate has fallen, similar results have occurred in the other areas treated. Important research work was carried at Krishnagar and the anopheline *A. philippinensis* incriminated as a local

carrier. Experimental work seemed to show that sporozoite development in *A. philippinensis* occurred more frequently in the months of October, November and December than at any other months.

**Kala-azar.**—Practically half of the deaths in the towns occurred in Calcutta. The districts of Central Bengal, Jessore, Nadia and Rajshahi returned the greatest proportion of deaths.

**Enteric fever.**—The mortality from enteric was twice as much in 1928 as in 1927.

**Relapsing fever.**—3,859 deaths were returned, but the diagnosis does not seem to have been questioned or confirmed.

**Dysentery and diarrhoea.**—The total mortality showed an increase of 4,061. December and January showed the greatest number of deaths and June the lowest. Bankura shows the highest figures, Rajshahi the lowest.

**Respiratory diseases.**—Mortality from these increased by 28 per cent. The death rate from pneumonia has been steadily increasing during the last 10 years. Similarly the death rate from phthisis has steadily increased. The town rate for phthisis is 10 times that of the rural areas. Darjeeling district gives the largest returns, Hooghly coming next.

The treatment of leprosy is receiving more definite attention now. In Midnapur, Malda and Bankura special surveys were made and several treatment centres opened.

**School hygiene.**—The staff for school inspection work was increased in 1928 by 3 part-time school medical officers. In Calcutta and in the mofussil many registered medical men undertook to work voluntarily, while other schools subsidised medical practitioners for the work. 13,750 scholars were inspected in 1928. 22.4 per cent. were well-nourished, 52.9 fairly well-nourished and 24.7 per cent. ill-nourished. Many defects were discovered. An Eye Clinic was opened at the Calcutta Medical College and 150 scholars were provided with free spectacles.

**Dai training.**—Many grants-in-aid were made or offered to local bodies but many were unable to make use of them.

**Publicity.**—88 exhibitions and 77 Health Weeks were organized. More than 400,000 pamphlets were distributed. Many new posters and charts were prepared and designed. The great demand for lectures, charts, posters and pamphlets testifies to the excellent work being done by the Publicity Department.

**Municipal expenditure.**—The average expenditure per head was Rs. 2,347: of this Re. 1-11 cost for conservancy and only 2.5 annas for medical relief, a little over 3 pies for vaccination.

**Rural areas.**—The average income per head was 5 annas. The average incidence of taxation was 2.1 annas per head. 11 pies per head was expended for medical relief and public health. These are startling figures and show how comparatively small an amount is being devoted to preventive measures in the district areas.

Under the rural health organization scheme 272 health circles worked. 3,005 Union Boards worked as against 2,260 in 1927.

**Public Health Laboratory.**—The Food Adulteration Act has lately been extended to rural areas and the Director reports that adulteration of food-stuffs in rural areas is going on on a very large scale.

A. D. S.

**KRISHNAGAR MUNICIPALITY. REPORT OF ANTI-MALARIA OPERATIONS FOR THE YEAR 1929-30.** By P. K. MUKERJEE, HEALTH OFFICER, KRISHNAGAR MUNICIPALITY.

THOUGH there is nothing actually new in this report, it is interesting as a statement of work actually carried out by an Indian Municipality, without outside pressure or help. Anti-larval measures over the whole seven square miles of the Municipality, on all water within that area, are said to have been undertaken, 1,831 pieces of water being treated 13 times each in the year.

Unfortunately the intervals between rounds is not given, though it is stated that spraying was continued throughout the year. The usual human difficulties were encountered in ensuring regular and efficient spraying. *A. fuliginosus* and its related species are implicated as the only carrier, in spite of the local existence of *stephensi* and *culicifacies*. In addition to anti-larval measures, house to house distribution of quinine was undertaken. This seems to be general with work in Bengal by local authorities, hence one can never know by which means the results obtained have been achieved. Quinine was distributed from July to December, nearly 117,000 doses in tablets of 4 to 5 grains each being given. No comparative statement of malarial incidence with previous years is given, nor is it possible to work out the incidence in 1929, as this is only recorded for four out of five wards of the town, whilst the population is only given for the whole municipal area. It is to be hoped that these points will be dealt with in subsequent reports.

R. S. W.

## Correspondence.

### A PLEA FOR MORE CONFIDENCE IN THE PERITONEUM.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR.—The article on the above subject by Lieut.-Col. W. F. Brayne, I.M.S., in your issue for July is very opportune. In this connection I may mention the following:—

(i) I have seen a surgeon of repute close almost all cases of 'acute abdomen' with which he had to deal. His percentage of successes was great.

(ii) Another surgeon used to try multiple drainage for stab wound cases, etc. His percentage of deaths was great.

(iii) A patient with a gastric ulcer which had perforated shortly after the mid-day meal. As chief assistant I was mopping out the foul contents of the peritoneal cavity when the anaesthetist reported the patient to be collapsing. A fairly large quantity of the stomach contents, consisting chiefly of rice and vegetables, had perforce to be left in the abdomen, which was hurriedly closed. The patient rallied, passed through a stormy attack of peritonitis, yet eventually recovered without drainage of the peritoneal cavity.

(iv) In recent surgical notes of mine from lectures delivered by a well known London surgeon, the following occurs:—

"The treatment of peritonitis by multiple drains in the flanks, vagina, and above the pubes, is now not favoured. Surgeons are now treating the cœlom as they treat the cavity of the knee joint; a quick entry and survey, rapid removal of fluid, get out and close up; it being found that the peritoneum can deal with its own infections. Any local abscess, however, must of course be drained."—Yours, etc.,

J. H. HENRIQUES, L.M. & S., F.C.P.S.,  
Medical Officer.

BULSAR,  
20th August, 1930.

### THE TREATMENT OF MALARIA.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR.—May I have the necessary space in your esteemed paper to discuss the value of quinine in malaria, not because I have something original to offer but to infuse courage and self-confidence into those members of the medical profession who have some inexplicable fear of the drug. There seems to be a great deal of confusion and uncertainty in the minds of many as to the quantities, time and methods of administration of quinine.

It should always be borne in mind that many English authors of textbooks on medicine give, in their chapters on tropical diseases, the treatment advisable in temperate climates. The same treatment would be next to useless in the tropics. Malaria must be treated promptly and effectively, especially cases of the more severe types. Col. Gidney recently stated in the Legislative Assembly that the bodies of those dead from malaria would, if placed alongside one another, cover the distance from the north to the south of India. This he very ingeniously termed "the malarial latitude of India." Can we picture a more deplorable state of affairs? This must be due to one or both of two things, (1) impure quinine, or (2) insufficient quinine. I am not in a position to discuss the purity or otherwise of drugs, but am convinced with no degree of uncertainty that many deaths from malaria are the result of insufficient quinine.

I shall now deal with the treatment of the various types of malaria as indicated in the tropics.

**Benign Tertian.**—The sulphate of quinine (10-15 grains) three times a day is most commonly administered in mixture form. The hydrochloride and bihydrochloride are preferable as they are more soluble and do not tend to irritate the stomach, as the sulphate does. If given in pill form, especially the sugar-coated, the sulphate is likely to be excreted unabsorbed. Some cases of malaria which do not improve with quinine, respond to Warburg's tincture. Further, I have found that the best hours to administer quinine orally are 6 and 10 a.m. and 2 p.m. the first dose one hour after a cup of milk, each dose being followed by a hot drink, preferably cocoa. Unpleasant symptoms due to quinine may be prevented by small doses of acid hydrobromia dil. combined with the quinine. Fowler's solution is another useful addition. The treatment by quinine should be continued for two months in gradually decreasing doses after the first two weeks.

**Malignant or Subtertian.**—The intramuscular injection of quinine is here the best and here again the bihydrochloride (grains 10-20) dissolved in 10 c.c. of distilled water is to be preferred. After 3 or 4 injections quinine may be continued by the mouth.

In the more severe forms of malignant malaria, e.g., the cerebral type, the intravenous route is the method of choice, grains 10-15 of the bihydrochloride dissolved in 20 c.c. distilled water injected into the vein at the bend of the elbow. No condition demands more prompt and energetic treatment, and yet there are some who play with quinine even at such a critical time and others who do not even do that. If there is no appreciable improvement within 6 hours, the intravenous injection should be repeated. Alarming symptoms practically never occur and the patient may, at the most, complain of tinnitus, vertigo, headache or dyspnoea. To give quinine half-heartedly in cerebral malaria and to adopt a "wait and see" policy—the sort of "masterly inactivity" advocated in midwifery—has nothing to recommend it, not even any miraculous recovery which may follow.

In the algid type of malaria, hypodermic saline is very essential in addition to quinine.

After the acute stage has passed, quinine in gr. x doses by the mouth may be continued three times a day combined with liquor arsenicalis m ii gradually increased to m viii.

In the event of any intolerance to quinine, neosalvarsan may be tried.

Finally, in submitting these views, I do not consider myself a Laveran, a Ross or a Manson, nor an authority on the subject, but have done so for the purpose set forth above. Whatever differences of opinion may exist, it will be agreed that the more severe types of malaria call for prompt and energetic treatment.—Yours, etc.,

E. S. FENNELL, M.B., B.S.

THE MALL,  
LUCKNOW,  
23rd September, 1930.

## ERRORS OF REFRACTION.

To the Editor, THE INDIAN MEDICAL GAZETTE.

SIR,—There is a discussion which has now been appearing for some time on this subject in the medical journals both of England and the U. S. A. St. Matthew says, "The light of the body is the eye," while Emerson in his happy style opines,

"Eyes speak all languages;  
Wait for no letter of introduction;  
They ask no leave of age or rank;  
They respect neither poverty nor riches,  
Neither learning, nor power, nor virtue,  
Nor sex, but intrude and come again,  
And go through and through you  
In a moment of time."

Bernarr Macfadden, the great American physio-culturist, dogmatically states that most diseases of the eyes, e.g., strabismus, myopia, hypermetropia, presbyopia, cataract, glaucoma, etc., can be cured or prevented with the practice of central fixation, eye relaxation, palming the eyes, reading the Snellen test card, with various eye and constitutional exercises, etc., instead of wearing spectacles which he calls eye crutches and which according to him have probably caused many more headaches than they have cured; and an oculist's (who abounds in these days without even a smattering of knowledge) prescription for eye strain is as extremely illogical as a twenty course supper for a dyspeptic. It is then evident that chronic invalidism of the eyes may be almost always prevented, if the cases are recognised in their early stages; and, if it may be said without offence, they may be saved from the machinations of these materialistic gentlemen who, as Professor Edwin Bramwell used to say, ignore not only the mental side of the picture but also the physical side, and by plicating a muscle or so for strabismus—operations which are nowadays fortunately going out of fashion—often merely serve to perpetuate a clinical picture which in almost every case can yield to measures devoted to hygiene and health, as Bernarr Macfadden has ably and clearly shown by facts based on scientific experiments by medical men and published in several medical journals: to mention only a few:

(1) *La Clinique Ophthalmologique*, December 1912.

(2) *New York Medical Journal* of 29th July 1911, 30th August 1913, 8th May 1915.

The above is written with due apologies to my professional brethren who practise the art of ophthalmology and also to those who practise optometry, in the hope that they may throw more light on this subject in this country. What impelled me to do so was that my sight, lately, after reading became blurred a bit, as I have been used to reading for many hours a day. I called in the help of a Fellow of the British Ophthalmological Association, an able man with wide experience. The glasses he prescribed instead of helping me seemed to non-cooperate with me. I mentioned this to my brother who at once sent me Bernarr Macfadden's book which I followed and led me to discard the spectacles without a moment's delay with benefit. The same was the case with the Chief of Sangli, who is now on his way to London to join the Round Table Conference, and so was the case with Macfadden himself.—Yours, etc.,

A. F. W. DA COSTA, F.R.C.S.E., etc.,  
Major.

HOSHANGABAD, C. P.,  
10th October, 1930.

## Service Notes.

## APPOINTMENTS AND TRANSFERS.

BREVET-COLONEL G. D. FRANKLIN, C.I.E., O.B.E., K.H.S., I.M.S., on return from leave, resumed charge of the duties of the Residency Surgeon, Hyderabad, with effect from the 20th September, 1930.

The services of Major B. G. Mallya, I.M.S., are placed temporarily at the disposal of the Government of Bengal with effect from the 28th March, 1928, for employment in the Bengal Civil Medical Department. His services were transferred permanently from the Jail Department, with effect from the same date.

The Governor in Council is pleased to appoint Captain R. T. Advani, I.M.S., on return to duty after completion of the Senior Officers' Course at Millbank to officiate as Superintendent and Medical Officer of the Ahmedabad Central Prison, vice Major B. Z. Shah, I.M.S., transferred.

## To be Captains (Provl.).

Gopal Das Malhotra, M.B. Dated 15th July, 1929, with seniority in the rank of Captain from 16th April, 1922.

Bantwal Panduranga Baliga, M.B. Dated 15th July, 1929, with seniority in the rank of Captain from 17th June, 1923.

Amar Nath Chopra, M.B. Dated 15th July, 1929, with seniority in the rank of Captain from 17th October, 1927.

Rewati Raman Bakhshi, M.B. Dated 6th November, 1929, with seniority in the rank of Captain from 19th August, 1930.

Raghubansa Kishore Tandon, I.M.S. (T.C.) Dated 15th July, 1929, with seniority 15th September, 1922.

Lieutenant (on prob.) A. K. M. Khan, M.B., F.R.C.S.I. is promoted to be Captain (Provl.) (on prob.), 15th July, 1930.

## To be Lieutenants.

Bhagwan Das Khurana, I.M.S. (T.C.). Dated 4th October, 1930, with seniority 28th October, 1927.

Diwan Chand Chopra, I.M.S. (T.C.). Dated 4th February, 1930, with seniority 19th November, 1927.

Jaswant Singh, I.M.S. (T.C.). Dated 22nd February, 1930, with seniority 19th November, 1927.

Debi Prasad Mitra, I.M.S. (T.C.). Dated 22nd February, 1930, with seniority 1st September, 1928.

Percy Vivian Bamford. Dated 15th July, 1929.

Harold Duncan Ross Zscherpel. Dated 15th July, 1929.

Anil Kumar Gupta, M.B., F.R.C.S. Dated 15th July, 1929.

Abani Kumar Chaudhuri, M.B., F.R.C.S. Dated 6th November, 1929.

## To be Lieutenants (on probation).

Douglas Jerrold Young, 5th August, 1930, with seniority 30th September, 1929.

Patrick Lawrence O'Neill, M.B., 5th August, 1930.

## LEAVE.

Lieutenant-Colonel T. L. Bomford, M.D., I.M.S., Civil Surgeon, Dacca, is granted leave for 1 year, with effect from the 15th October, 1930.

Major L. A. P. Anderson, M.B., I.M.S., Officiating Director, Haffkine Institute, Bombay, is granted leave on average pay for 8 months, with effect from the 9th November, 1930, or any later date on which he is relieved of his duties by Brevet-Colonel F. P. Mackie, O.B.E., K.H.S., M.D., M.Sc. (Bristol), F.R.C.P. (Lond.), F.R.C.S. (Eng.), D.P.H., I.M.S.

## PROMOTIONS.

Brevet-Colonel R. McCarrison, C.I.E., M.D., F.R.C.P., K.H.P. (Supy.). Dated 5th November, 1929.

The promotion of Lieutenant-Colonel D. Coutts to the rank of Major and Lieutenant-Colonel is antedated to 27th January, 1919, and 27th January, 1927, respectively.

Captain (Provl.) B. N. Hajra, M.B., is confirmed in his present rank.

## Lieutenant to be Captain (Provl.).

K. H. A. Gross, M.C. Dated 26th July, 1929.

## RETIREMENTS.

Lieutenant-Colonel J. McC. A. Macmillan, M.P., F.R.C.S., 2nd September, 1930.

Lieutenant-Colonel T. C. McC. Young, M.D., 5th September, 1930.



Lieutenant V. H. Sarland, M.B., resigns his Commission, 21st August, 1930.

The following retirement is permitted subject to His Majesty's approval:—

Lieutenant-Colonel H. W. Illius, C.I.E., F.R.C.S.E. Dated 9th October, 1930.

## Notes.

### SOMNOSAL.

"SOMNOSAL" is a sedative and soporific manufactured by the well-known firm of H. R. Napp, Ltd., 3 and 4, Clements Inn, London, W.C. 2. It is stated to be a combination of a brom-iso-valerianyl urea, gr. 5, with di-methyl-amido-phenyl-di-methyl-iso-pyrazolon, gr. 2.5; soluble in alcohol and the ordinary organic solvents, but only partly soluble in water. The compound is designed to meet the urgent need for a reliable sedative of negligible toxicity, free from barbiturates and opiates, and with a rapid action. As a sedative the dose is 1 to 2 of the 7½-grain tablets, taken with cold-water; as a soporific 2 tablets taken with hot water, hot milk, or weak hot tea. Several reports speak well of its value in the relief of pain, in insomnia, in securing sleep and relief from pain in pneumonia, in dysmenorrhœa, and in hysterical conditions. Messrs. Napp circulate literature to the medical profession only, and—unlike some other firms—do not go in for wholesale advertising elsewhere. The Indian agents are Messrs. Smith, Stanistreet & Co., P. O. Box 172, Calcutta.

**A REVIEW OF ARTIFICIAL LIGHT THERAPY.**  
BY R. KING BROWN, B.A., M.D., D.P.H. 32 pp. 1929. PRICE, 2s. LONDON, THE ACTINIC PRESS LTD., 17, FEATHERSTONE BUILDINGS, W.C. 1.

THE true position of ultra-violet light therapy in the practice of medicine and surgery is not as yet defined. Sir William Willcox states that "it has an important place in modern therapeutics." On the other hand, a recent report by the National Council of Medical Research of Great Britain states that in the treatment of undergrowth, backwardness, etc., in school children, it did not seem to be of value.

In this small brochure, Dr. King Brown attempts an analysis of the hitherto published reports on the use of ultra-violet rays in medical and surgical diseases, ophthalmic, laryngological, and gynaecological practice, in pregnancy and lactation, and the apparatus necessary and its cost. The brochure is rather a list of the conditions in which light therapy has been found of value than a full discussion on the merits and demerits of the method; still, it will probably prove of interest to members of the medical profession in this country. Copies are available at Re. 1 each from Messrs. Malgham Bros., 26, Custom House Road, Fort, Bombay. The book is published by the publishers of the *British Journal of Actinotherapy and Physio-therapy*.

### CALCIMINT.

THE administration of calcium salts is to-day widely resorted to in medicinal treatment. Calcium therapy in general improves the nutritional condition; it is of value in bone disease and in the development of the teeth; it is often administered in hay fever, asthma, pulmonary tuberculosis, and influenza; it is used in a wide variety of hæmorrhagic conditions; in many skin conditions; in nervous diseases, spasmophilia, and epilepsy, whilst it is claimed that it is antagonistic to nicotine. Serum disease is also a condition in which the administration of calcium salts is especially indicated.

In this connection a preparation, "Calcimint," by the Munchener Pharmaceutical Works, is of interest. It is a tablet, stated to contain the lactate, carbonate,

formate, glycerophosphate, and phosphate of calcium, and is delicately flavoured with peppermint. The tablets are extremely palatable. The dose advocated is from 2 to 3 tablets daily 4 or 5 times, slowly dissolved in the mouth. Each tablet is 0.75 gm., and they are put up in bottles of 100. The Indian agents are Messrs. Frank Ross Ltd., 15, Chowringhee, Calcutta, and Messrs. Thomson & Taylor, Ltd., Esplanade Road, Bombay; the British agents are Messrs. Coates & Cooper, 41, Great Tower Street, London, E.C. 3.

### ANTIPLHLOGISTINE.

"PAIN," to quote Romberg's famous dictum, "is the prayer of a nerve for healthy blood."

Certain nerves seem to be placed as sentinels by nature to warn of impending danger. These nerves, or sets of nerves, are endowed with a greater susceptibility to inflammatory processes and cry aloud in accents of pain as soon as the organ as a whole feels the effect of the invading bacteria.

The observations of research workers have proved that under the influence of tropical moist heat, lymph circulation is materially increased and this results in—

- (c) The washing-out of the tissues.
- (b) An accelerated resorption.
- (c) A more thorough cell nutrition.
- (d) Reduction of the infiltration.

Fresh blood contains nutritive elements, vitamins, oxygen, leucocytes, immunizing bodies and enzymes. Moreover, such induced hyperæmia permits a tissue drainage which removes accumulations of altered cell metabolism and functional products. A normal supply of blood carries away organic debris, exudates and extravasations.

For daily emergency practice, considering the advantages and disadvantages of all other therapeutic procedures, investigators and clinicians of international reputation have found that in order to prevent or to treat local inflammatory processes and to avoid the formation of pus as early as possible, Antiphlogistine, covered with an impermeable membrane, will yield the best results, because it retains moist heat and need not be changed for a long time.

### "HAZELINE" SNOW—NEW TUBE PACKING.

MESSRS. BURROUGHS WELLCOME & Co., Snow Hill Buildings, London, E.C. 1, have recently introduced a collapsible tube packing of their well known "Hazeline" Snow which hitherto has been obtainable only in pots. "Hazeline" Snow contains a high percentage of 'Hazeline,' and is intended for application to the skin by which it is readily absorbed, removing redness and roughness. It also forms an ideal basis for powder. "Hazeline" Snow is also suitable for masculine use after shaving, removing the soreness, burning and irritation which are the daily trials of those whose skin is tender.

### "EMPLETS," PARKE, DAVIS & CO.

MESSRS. PARKE, DAVIS & Co., P. O. Box 88, Bombay, have recently put on the market new preparations of enteric-coated gland products under the trade name of "Emplets." It is claimed for this special coating which is free from salol and keratin, that it is acid-fast but alkaline-soluble, that the product will pass through the stomach unchanged, and without causing nausea, and will dissolve in the small intestine. Such a preparation, it is claimed, is far superior to prescribing desiccated powders of gland substance which may be vomited. The "Emplet" preparations include "Emplets" of ovarian substance, 5 gr.; corpora lutea substance, 2 gr.; orchitic substance, 5 gr.; parathyroid gland substance, 1/10th grain; suprarenal gland, 2 gr.; and thyroid gland, 5 gr. and 1½ gr. These new preparations will be of considerable interest to our readers.



### EPHEDRINE, B.D.H.

EPHEDRINE is coming more and more into use in medicine to-day. Whilst it is indicated chiefly in the treatment of asthma, hay fever, and whooping cough, it is also of value when injected intravenously in obstetric shock, in reduced blood pressure, to prevent a fall in blood pressure during spinal anaesthesia, intrathecally in poliomyelitis, and in the treatment of addiction to opium and morphine. The British Drug Houses have recently issued a small brochure dealing with their preparation, Ephedrine, B.D.H., containing a summary of the literature on this product, with instructions for its use and indications. It is put up in tablets for oral and hypodermic administration, as an elixir, in ampoules for hypodermic injection, as an inhalant, and as a nasal spray and a nasal jelly. This small brochure will be of interest to many of our readers.

### BENZO-BISMUTH.

We have recently received a copy of a small pamphlet issued by the Anglo-French Drug Co., P. O. Box 460, Bombay, dealing with their preparation "Benzo-Bismuth." This is a soluble bismuth preparation for intramuscular injection in cases of syphilis, yaws, etc. It is put up in packages of 5 ampoules with 5 ampoules of solvent. The pamphlet contains an abstract of an article by Dr. Henri Drouin from *Medica* for March 1928 on the use of soluble bismuth salts in the treatment of syphilis, and another from the *Medical Practitioner* of March 1930 which includes a standardised scheme for the treatment of syphilis by injections of Sulfarsenol and of Benzo-Bismuth. The Anglo-French Drug Co. will be glad to send copies of this outline scheme for standardised treatment to medical men upon application.

### WATSON'S MICROSCOPE RECORD.

A RECENT issue of the *Microscope Record*, No. 20, published by Messrs. W. Watson & Sons, 313, High Holborn, London, W.C. 1, maintains the high standard set by this trade journal. This small quarterly brochure will be of interest to all laboratory workers and microscopists in India, for it is full of useful information. In issue No. 20, Prof. F. E. Lloyd of the McGill University, Montreal, deals with the dark-ground study of algae; the Rev. D. P. Fuge with unusual diatom forms; there is an important and long quotation from Koch's writings on the first introduction of the Abbé sub-stage condenser; a new and ingenious insect holder is described; C. F. Bause deals with the mounting of fresh-water algae; whilst editorial notes deal with the recording of photographs by dissecting microscopes, and the alignment of the microscope system.

Whilst the *Microscope Record* is admittedly a trade journal, yet we believe that laboratory workers will find many hints of value and instructive articles in its pages. It is posted free on application to Messrs. Watson & Sons.

### BIOCHEMICA, "ROCHE."

We have recently received from F. Hoffmann-La Roche & Co., Ltd., Basle, Switzerland, a copy of their new catalogue—"Biochemica, Roche"—of biochemical products. The products of this firm are very well known and reliable, and our readers may be interested to know of the new catalogue. It is printed in German, but the nomenclature used for the biochemical products listed is international. The Hoffmann-La Roche Co. will be pleased to send copies on application by medical men.

### CYLOTROPIN, SCHERING.

CYLOTROPIN is a preparation introduced by Messrs. Schering-Kahlbaum (India), Ltd., P. O. Box 2006, 4, Dalhousie Square, Calcutta, for intramuscular injection in cases of cystitis, gonorrhoea, *B. coli* septicaemia, and

infections of the genito-urinary tract. Clinical reports speak well of results with this preparation. The manufacturers will be glad to supply literature and case reports to medical men upon application to them.

### X-RAY ACCESSORIES.

We have recently received from Messrs. Watson & Sons (Electro-Medical), Ltd., Sunic House, 43, Parker Street, Kingsway, London, W.C. 2, a copy of their new catalogue of X-ray accessories—bulletin No. E. I. This includes descriptions of their X-ray tubes, dental tubes, "Metalix" tubes, adapters, and diaphragms, filters for X-ray therapy, meters, automatic timers, fluorescent screens, the Sunic Potter-Bucky diaphragm, localisers, film changers and compressors, viewing boxes and stereoscopes, pastilles and tintometers, protective materials, rotary converters, film storage cabinets, intensifying screens, chemicals, and materials for opaque meals, cholecystography, etc.

Together with their other two brochures, one the *Transformer Booklet*, and the other the *Screening Stand Booklet*, this trio completes Messrs. Watson & Sons series of X-ray catalogues. All three will be of interest to radiologists in India, as the workmanship and apparatus put out by this well known firm are unimpeachable.

### "CAVOSEPT," A VAGINAL DISINFECTANT.

In many instances where vaginal disinfection is indicated, it may be preferable to avoid the douche, or indeed a douche may not always be available. In such cases physicians have found that "Cavosept" is a handy and effective means of securing prompt antiseptic action. When inserted in the vagina, the tablets liberate an antiseptic and a considerable amount of oxygen which ensures penetration of the antiseptic agent into the minute vaginal folds. These tablets have been frequently recommended as an aid in correcting leucorrhœa, cervicitis, and in all instances where a prompt and definite local antiseptic action is desired either as a corrective measure or for prophylactic. Further information on "Cavosept" can be obtained from the Cavendish Chemical Co., Ltd., 137, Regent Street, London, W.1, England.

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